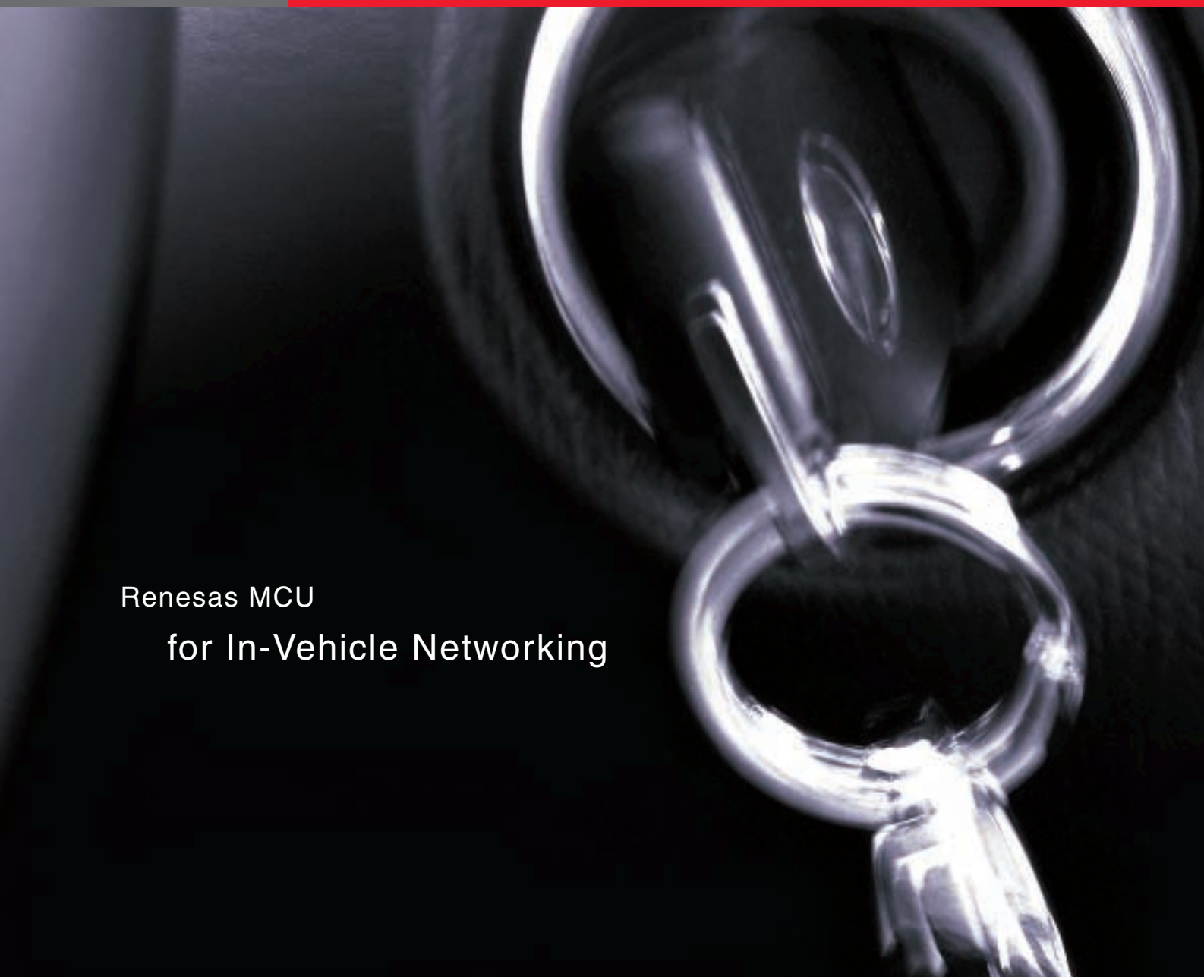
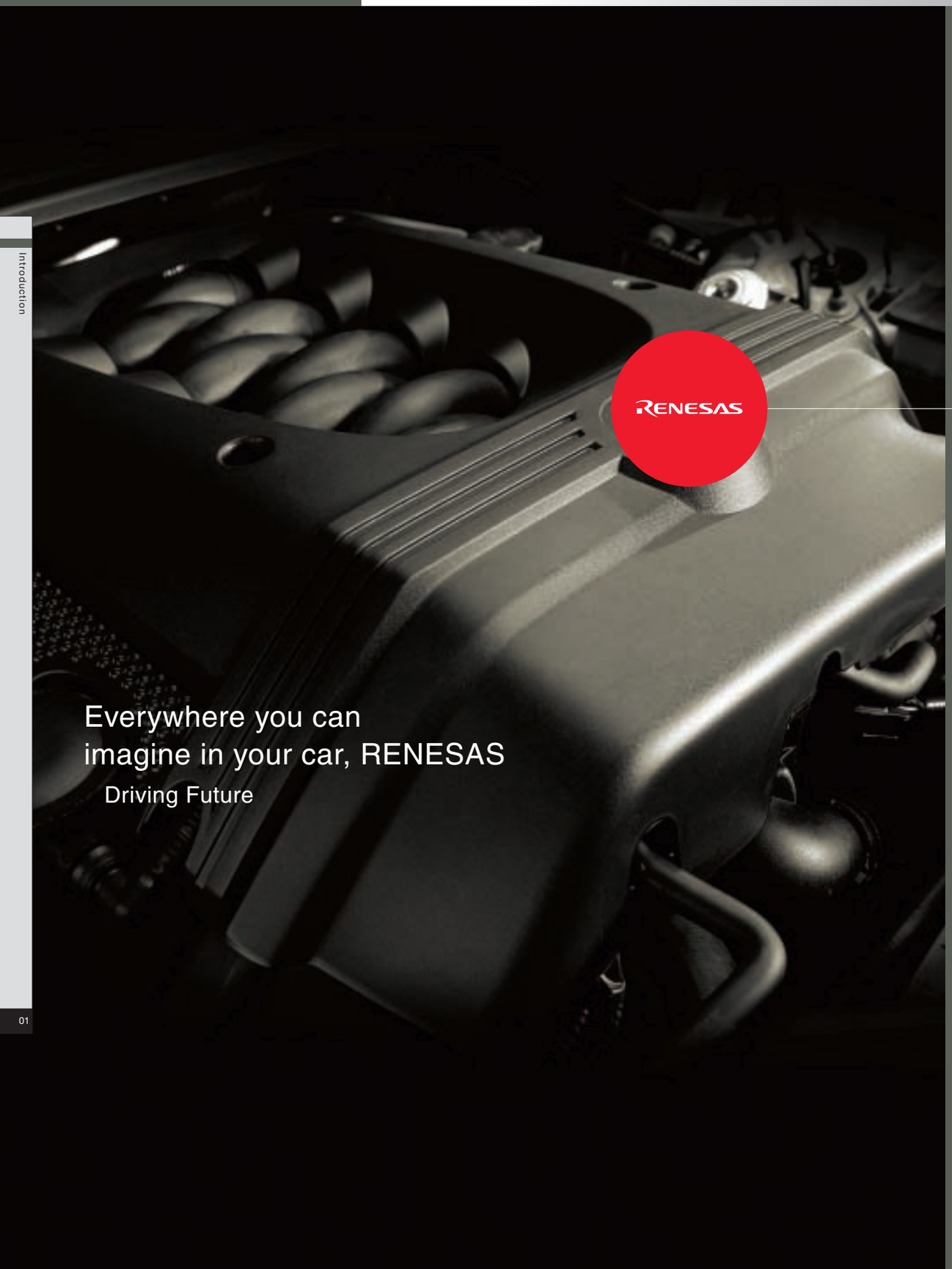
2006.10

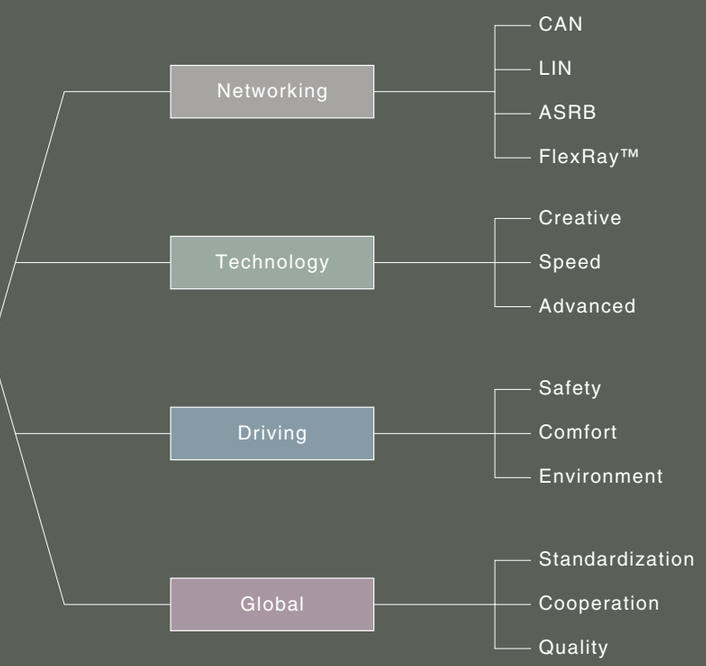
Everywhere you imagine. RENESAS

# Renesas MCU
# for In-Vehicle Networking




Renesas Technology
www.renesas.com

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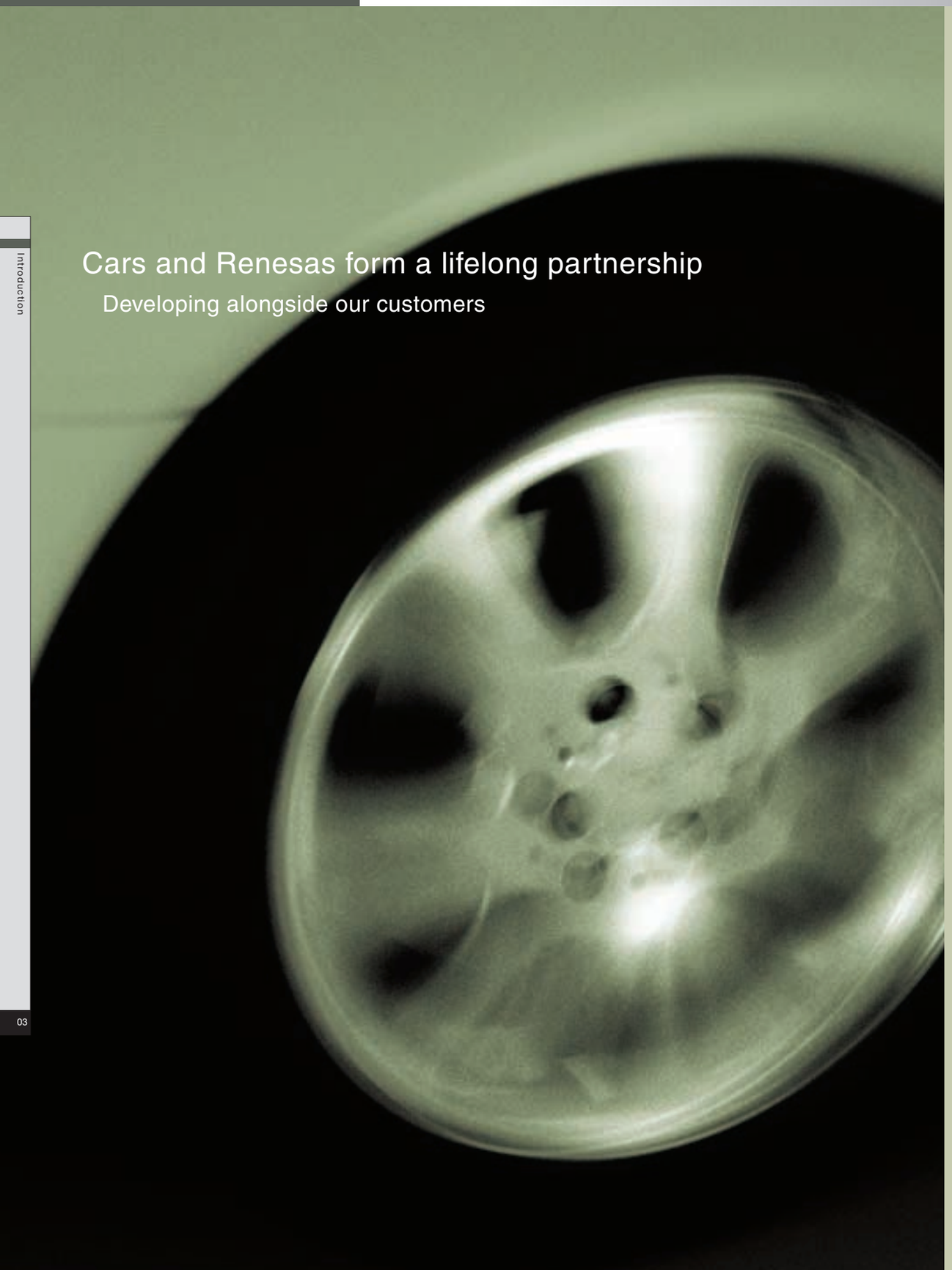


# Cars and Renesas form a lifelong partnership

## Developing alongside our customers



Renesas Technology Corporation manufactures semiconductors and the tools to use them. Our efforts include a commitment to standardization and functional safety.
Renesas provides technology to match the customer's development phase, creating products from scratch or adapting products to suit.
Renesas will support its customers for as long as the car exists.

### Functional Design

Drawing on our experiences as a participant in the in-vehicle networking related consortiums and standardization organs, we can cooperate in your endeavor to create safer and more comfortable cars, all the way from the functional design and component design stages.

### Functional Verification

Renesas' abundant debugging environments linked with the tools from partner vendors provide you with a comfortable verification environment.
Furthermore, our support organization enables us to promptly respond to your need for support.

### Component [ECU] Design

With our vast range of tool chains, middleware, and the application notes we have available, Renesas provides you with an efficient and secure component design environment.

- Language Tools (integrated environment tools)
- Middleware (e.g., device driver and realtime OS)
- Compiler

Tool products include the tools made by our partners.

### Component [ECU] Verification

The MCUs suitable for adaptability test and the in-vehicle networking communication analyzers used in unit test available from Renesas will help you increase the efficiency of your component verification.

### MCUs

Renesas offers you an extensive line of MCUs featuring a wide selection of packages, superior EMS/EMI performance and Low-power operation, allowing you to choose the most suitable MCU for your application.

- SH family
- H8SX family
- H8S family
- R32C series
- M32C series
- M16C series
- M16C/Tiny series
- R8C/Tiny series
- H8/Tiny series

### Packaging, Assembling, and Mounting

### Tools

Thanks to our tool line-up, offering high levels of operability and functionality, we provide our customers with a smooth and comfortable debugging environment.

- Emulator
- Debugger

Tool products include the tools made by our partners.

# Imagining the future for the automotive industry

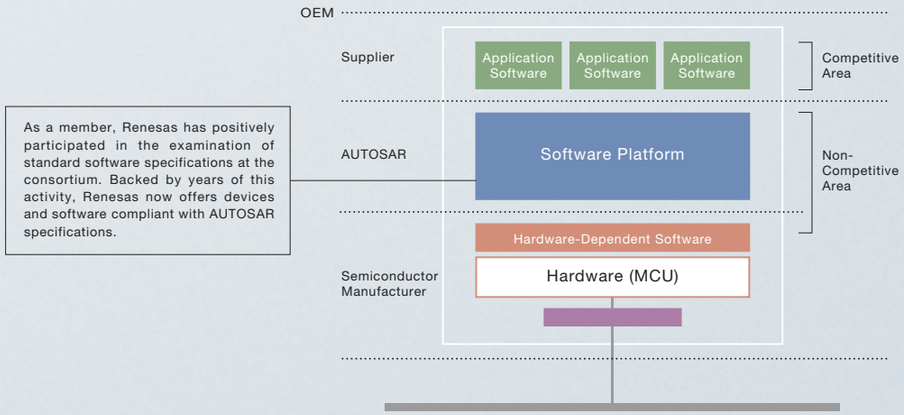
## Striving toward Standardization

Standardization bodies conduct various standardization activities, in order to promote safe and efficient car manufacturing.
Renesas works with the standardization organizations AUTOSAR, the FlexRay Consortium to establish a basis for future car manufacturing and to provide customers with optimum solutions.

## FlexRay Consortium

Aiming for the introduction of the X-by-Wire system that was devised in pursuit of high speed and high reliability, the FlexRay consortium is formulating specifications of the communication protocol, physical layer and adaptability test.
Renesas, an associate member of the FlexRay Consortium since 2002, has endeavored to reflect Consortium results in our devices and tools as rapidly as possible.
Thanks to FlexRay Consortium achievements and the technology we have acquired through our Working Group activities, we can offer you world standard FlexRay devices and development environments that you can depend on.

- Joined the FlexRay consortium in December 2002


OEM
Supplier
Application Software
Application Software
Application Software
Competitive Area
AUTOSAR
Software Platform
Non-Competitive Area
Hardware-Dependent Software
Semiconductor Manufacturer
Hardware (MCU)
As a member, Renesas has positively participated in the examination of standard software specifications at the consortium. Backed by years of this activity, Renesas now offers devices and software compliant with AUTOSAR specifications.

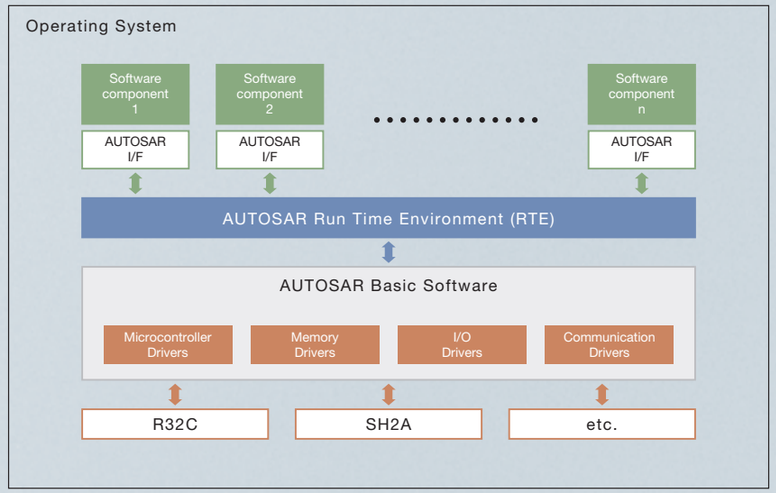
## AUTOSAR Automotive Open System Architecture

AUTOSAR, a consortium composed mainly of automobile manufacturers (OEMs) and electrical equipment manufacturers (suppliers), aims to develop common-use automotive software and electronic architecture. As a “Premium Member”, Renesas is committed to activities for the standardization of software platforms and development processes, through participation in work packages relating to in-vehicle networking software-related, such as CAN, LIN and FlexRay.
Through cooperation with our partner tool vendors, we offer AUTOSAR compliant software components*, and reliable development platforms conforming to world standards.

*Note: R32C, SH2A supported AUTOSAR Basic Software(Under development): Scheduled to release at the end of 2006

- Joined AUTOSAR as a premium member in July 2004

The Final Objective of Software Standardization by AUTOSAR




## Functional Safety

In recent years, the issue of “Functional Safety” has come under worldwide scrutiny. Functional safety is now an essential technology in the future development of embedded systems.
Renesas strives for integrated safety design based on the basic principles of the IEC 61508 functional safety standard.

- Joined CiA and ISO in 1999
- Joined the LIN consortium in 2001
- Joined the MOST consortium in 2002
- Joined the Safe-by-Wire Plus consortium in 2004

Computex Taipei 2006

AES2006

9th Embedded
System Development
Technology Exhibition

FlexRay ProductDay 2005

9th Automotive Electronics Congress

Computex Taipei 2005

## Shaping the future of automotive technology

### In pursuit of new technologies

Renesas' new technology can be experienced around the world.

21st Electronica 2004

15th Convergence 2004

Renesas Solution Seminar

FlexRay Evaluation Environment

LIN Clearance Sonar
Demonstration Set

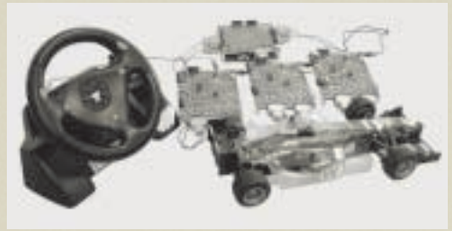
SbW+ Evaluation Board

Brake-by-Wire
Demonstration Set

In-vehicle Networking Integrated System
Demonstration Set

FlexRay Mounting Cart

Joint development by Witz Corporation,
Sunny Giken Inc. and Renesas



Steer-by-Wire Demonstration Set

Joint development by Witz Corporation, and Renesas

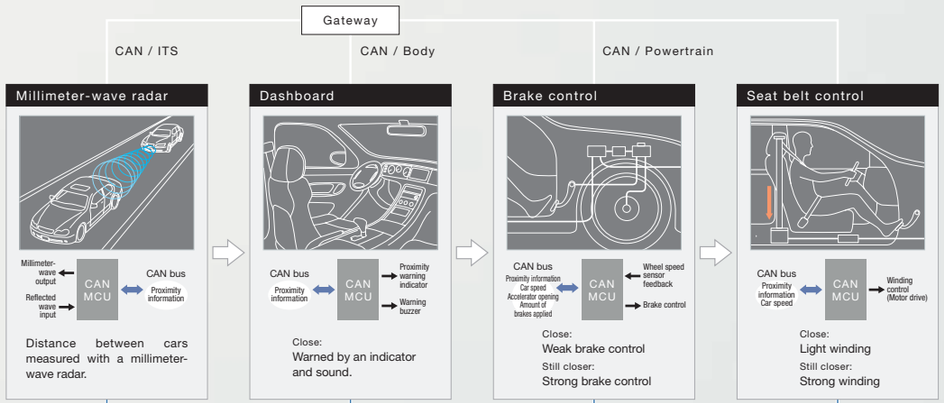
# Supporting automotive evolution

## Supporting the expansion of In-Vehicle Networking

Environment-friendly cars, safe and comfortable cars,
cars we all want to drive.
Renesas technology supports these ideals.

## CAN
Controller Area Network

CAN currently is the de-facto standard protocol among in-vehicle networking. Not just in the basic trunk network, it is widely used in the powertrain and body systems, too.

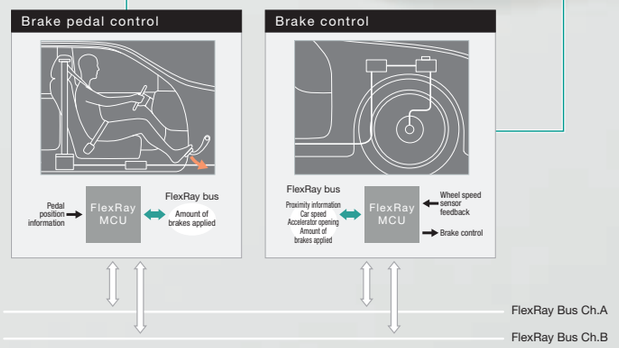



Collision Detection System

Brake-by-Wire System

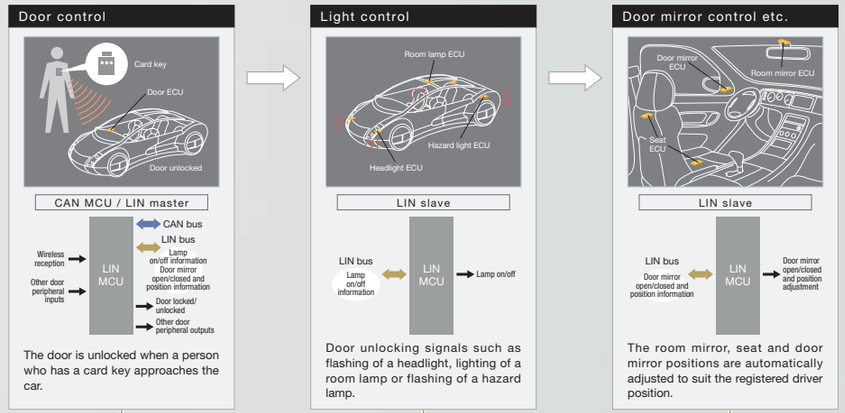
## FlexRay
X-by-Wire

FlexRay is a high-speed communication protocol featuring superior flexibility and high reliability.
Devised by automobile and electrical equipment manufacturers and semiconductor vendors, it is watched as a most promising in-vehicle networking protocol for the next generation X-by-Wire system.



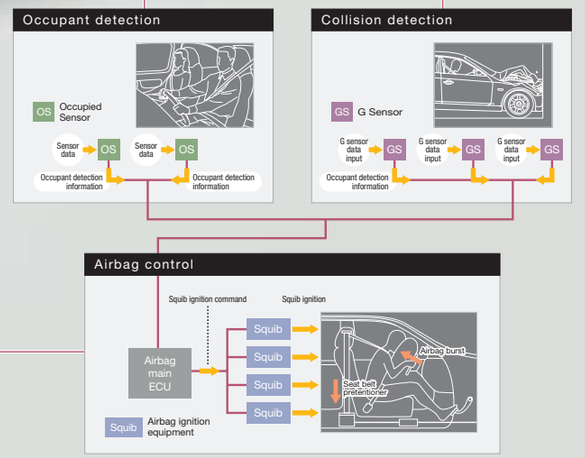

## LIN
Local Interconnect Network

LIN is a single-master in-vehicle networking protocol that excels in cost/performance ratio.
It is used in switch input and sensor input actuator control.


Door control
Card key
Door ECU
Door unlocked
CAN MCU / LIN master
Wireless reception
Other door peripheral inputs
LIN MCU
CAN bus
LIN bus
Lamp on/off information
Door mirror open/closed and position information
Door locked/unlocked
Other door peripheral outputs
The door is unlocked when a person who has a card key approaches the car.
Light control
Room lamp ECU
Hazard light ECU
Headlight ECU
LIN slave
Lamp on/off information
Lamp on/off
Door unlocking signals such as flashing of a headlight, lighting of a room lamp or flashing of a hazard lamp.
Door mirror control etc.
Door mirror ECU
Room mirror ECU
Seat ECU
Door mirror open/closed and position information
Door mirror open/closed and position adjustment
The room mirror, seat and door mirror positions are automatically adjusted to suit the registered driver position.

Multifunction Keyless System

Next Generation Air Bag System



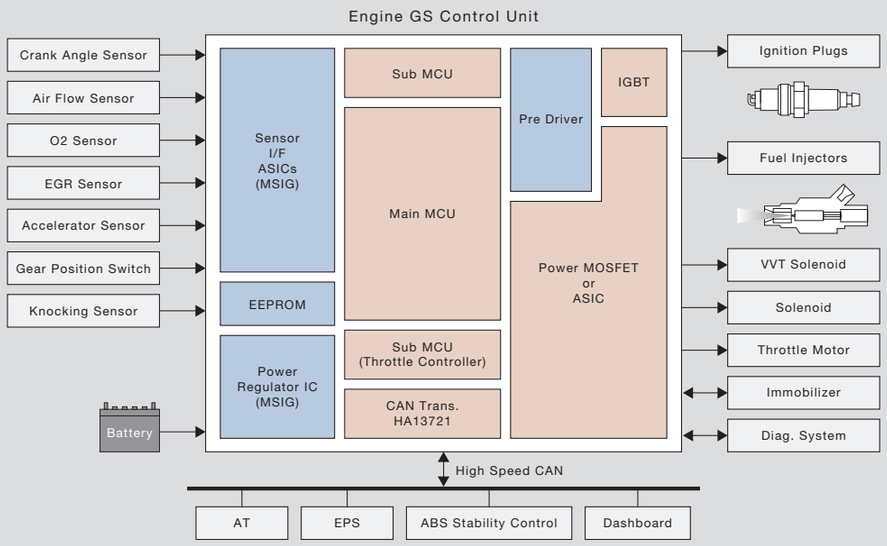

## ASRB
Safe-by-Wire Plus

ASRB is a protocol designed for the inclusion of ignition systems, such as collision sensors and airbags, in the Networking system.
It is watched with interest as an in-vehicle networking protocol for the next generation air bag system.

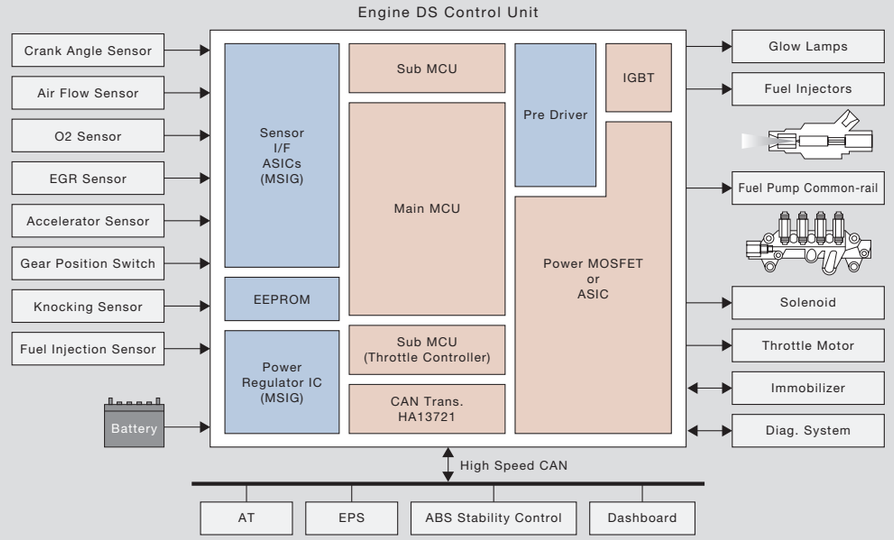
# Powertrain

Powertrain systems must achieve current or even higher engine power at a lower system cost level, while offering improved fuel efficiency and reduced exhaust emissions.
To satisfy these demands, applied technology capabilities must be improved, as well as compatibility with new communication interfaces and software.
Renesas supplies products that meet these stringent requirements, such as IGBTs, Power MOSFETs, CAN transceivers, voltage regulators, and microcontrollers.

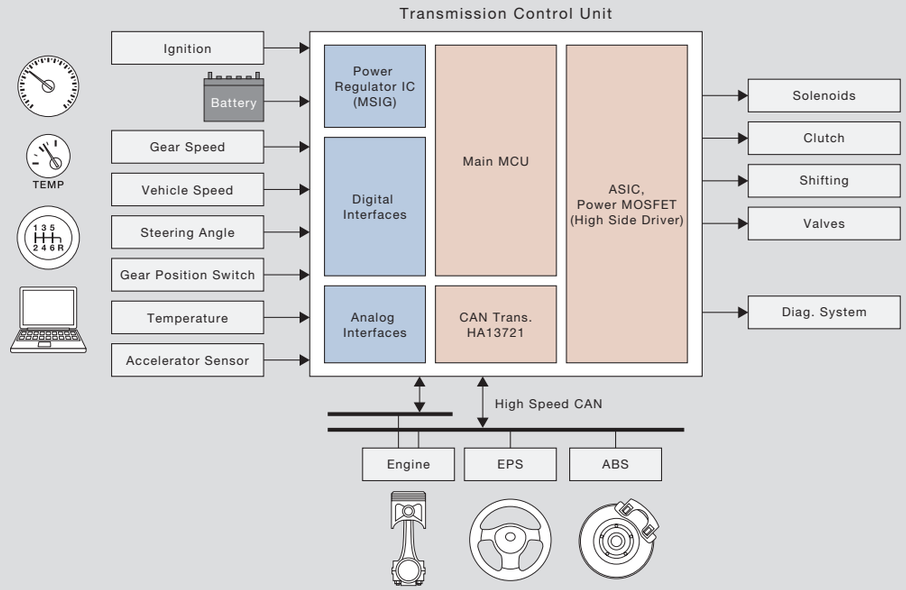
## Engine-Gasoline System




## Engine-Diesel System



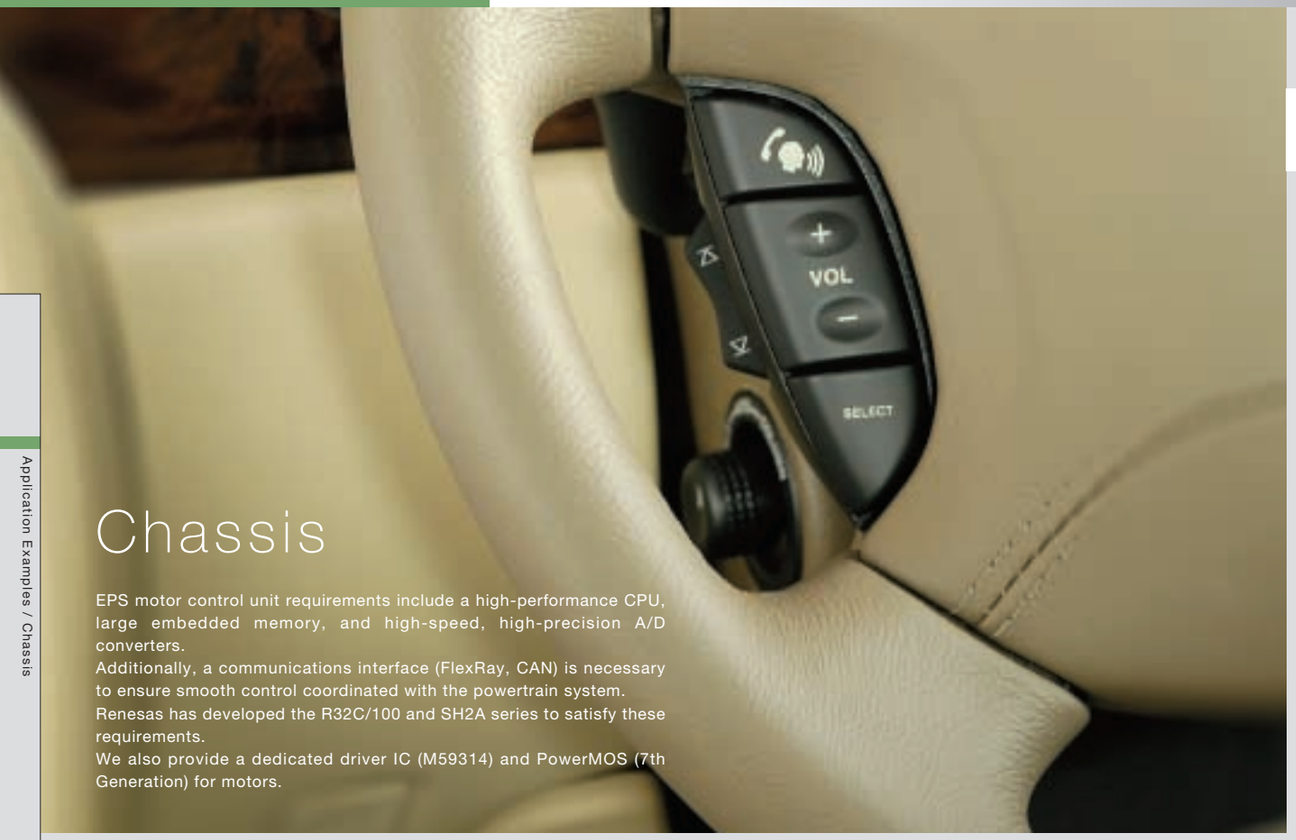

## Transmission Control System







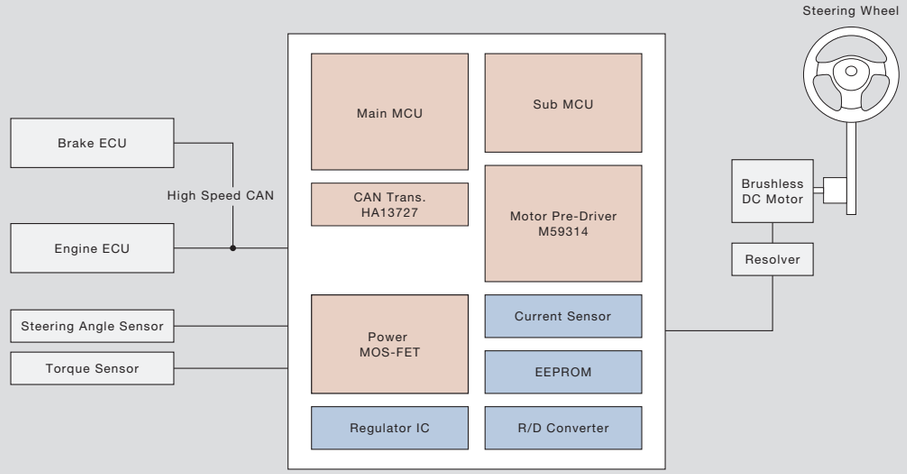
Application Examples / Powertrain



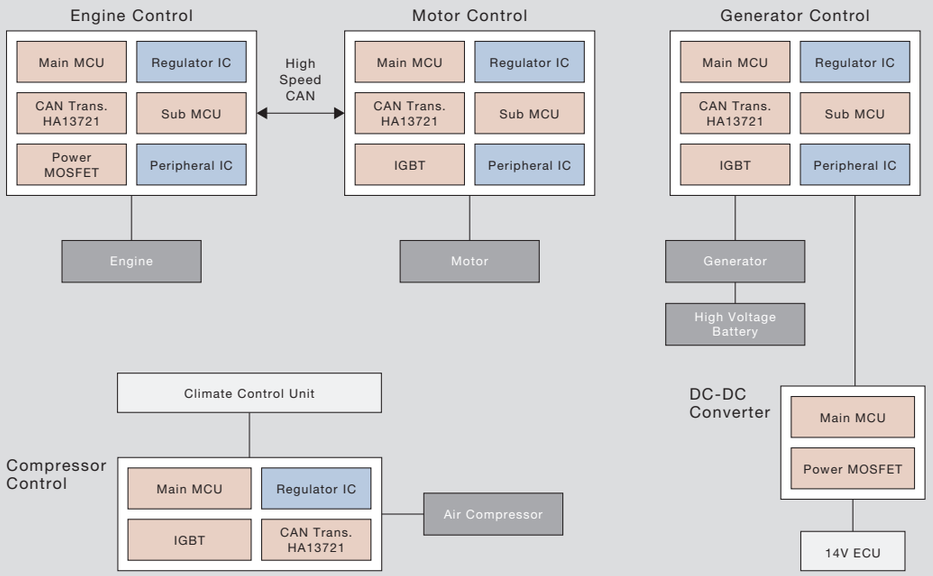

# Chassis

EPS motor control unit requirements include a high-performance CPU, large embedded memory, and high-speed, high-precision A/D converters.
Additionally, a communications interface (FlexRay, CAN) is necessary to ensure smooth control coordinated with the powertrain system.
Renesas has developed the R32C/100 and SH2A series to satisfy these requirements.
We also provide a dedicated driver IC (M59314) and PowerMOS (7th Generation) for motors.

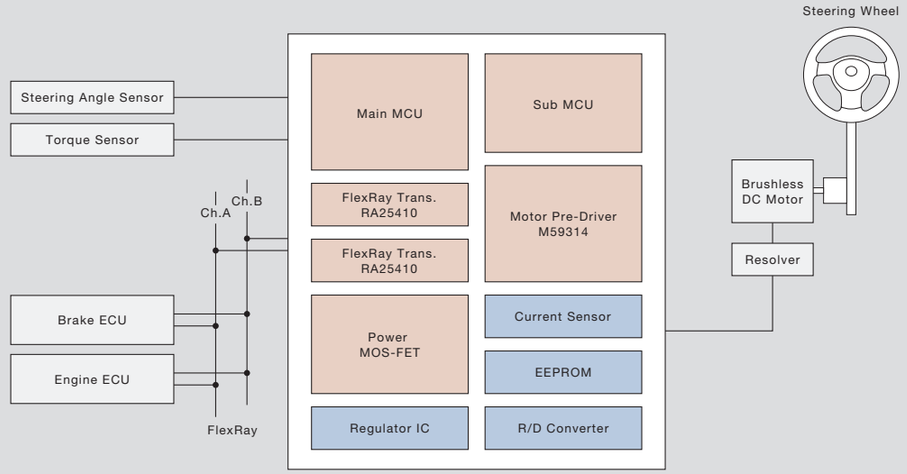
## EPS




## HEV

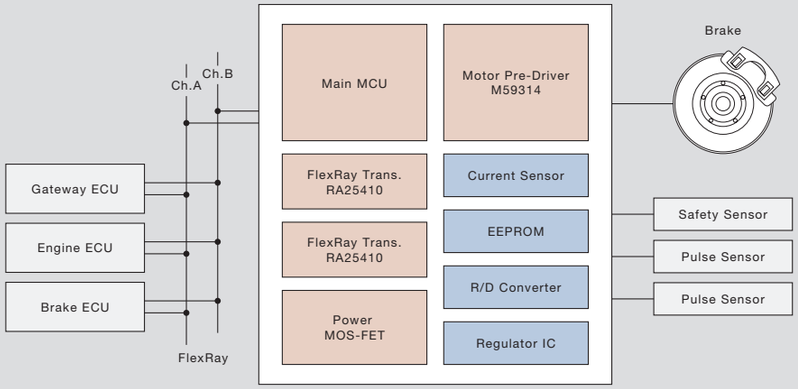



## EPS / FlexRay

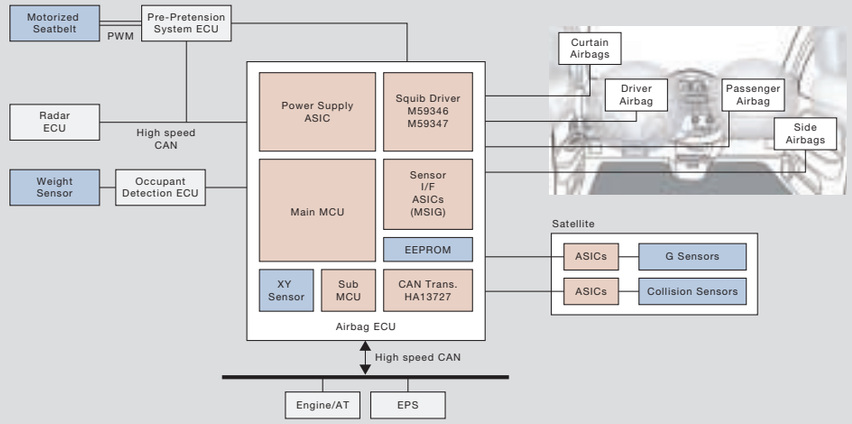


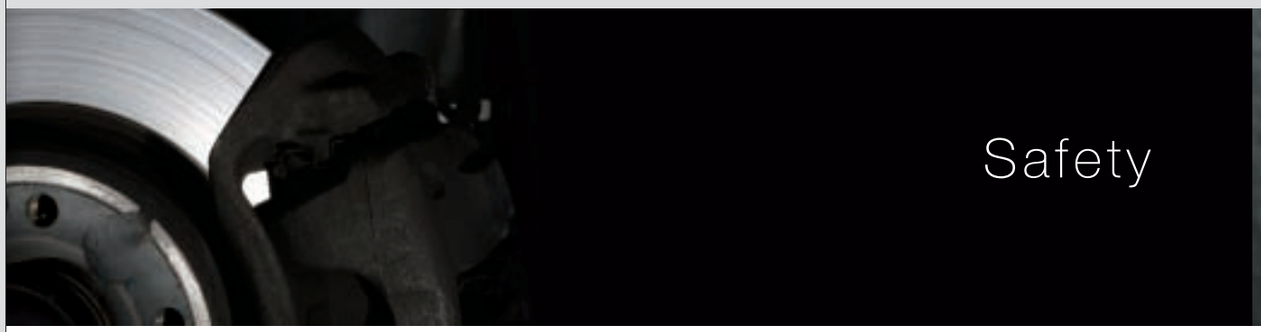
## Brake-by-Wire System / FlexRay

The motor control unit, needed to make the shift from current mechanical brake control to a Brake-by-Wire system, requires a communications interface (FlexRay) with other CPUs, a high-performance CPU, and high-speed, high-precision A/D converters. Renesas has developed the R32C and SH-2A series to satisfy these requirements.
We also provide a bus driver IC (R2A25410) for use with the FlexRay interface, and a dedicated driver IC (M59314) and PowerMOS (7th Generation) for motors.




## Airbag

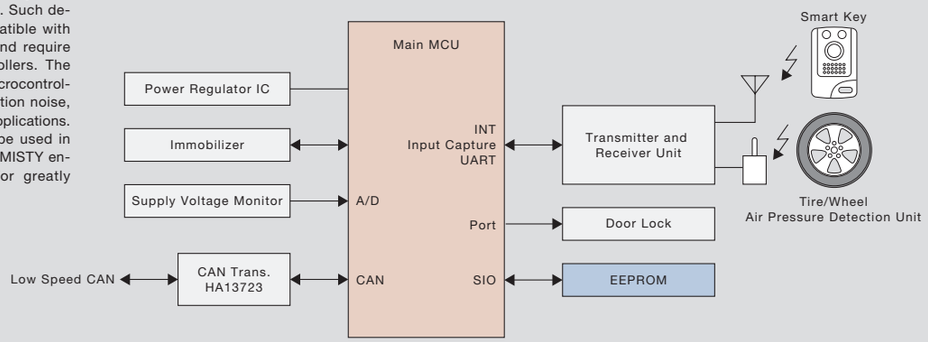


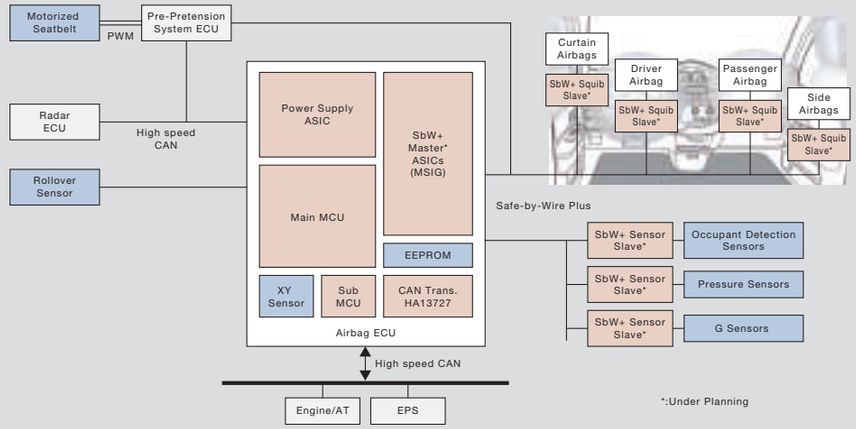
An increasing number of airbag systems mounted with a satellite sensor are used today to detect collision impacts more effectively, thereby further enhancing occupant protection performance in automobile crashes. Microcontrollers to be used in these airbag systems must be able to process enormous amounts of data transmitted from satellite sensors at higher and higher speeds.
High-speed SPI interfaces, timer modules, CAN modules, and other flexible peripheral interface architectures are also required for communications with peripheral devices and collaborative control with other computers.
With a product lineup from low- to high-end products, Renesas microcontroller series offers the best solution for automotive safety, ranging from occupant detection to airbag deployment controllers.
Renesas also offers market-proven mixed signal-based squib drivers and sensor ASICs that are uniquely suited to particular system needs.
Renesas is also engaged in developing system solutions for “Safe-by-Wire Plus” (ASRB 2.0) that is now drawing attention as a next-generation airbag communication protocol.

## Smart Keyless / TPMS (Tire Pressure Monitoring Systems)

In recent years, automotive systems have started to use radio wave technology, such as keyless entry, smart entry, tire pressure sensors etc. Such devices must be compatible with CAN/LIN networks and require low EMI microcontrollers. The Renesas CAN/LIN microcontroller, with its low radiation noise, is suitable for such applications. Furthermore, it can be used in conjunction with the MISTY encryption protocol, for greatly improved security.



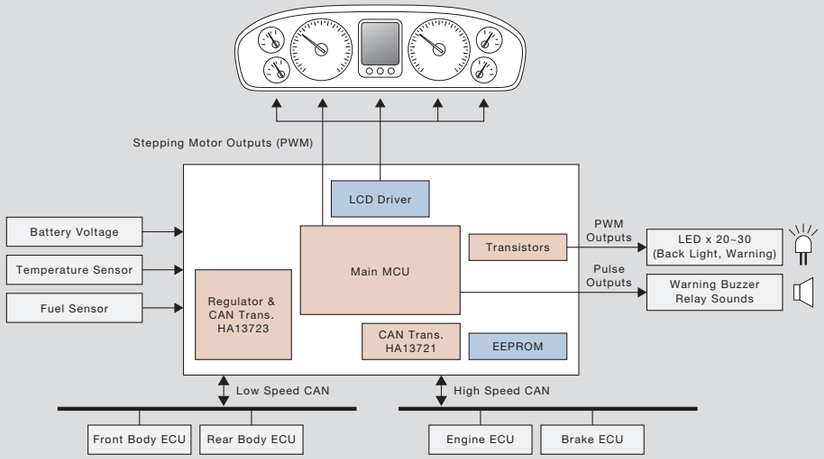

## Airbag / ASRB (Safe-by-Wire Plus)



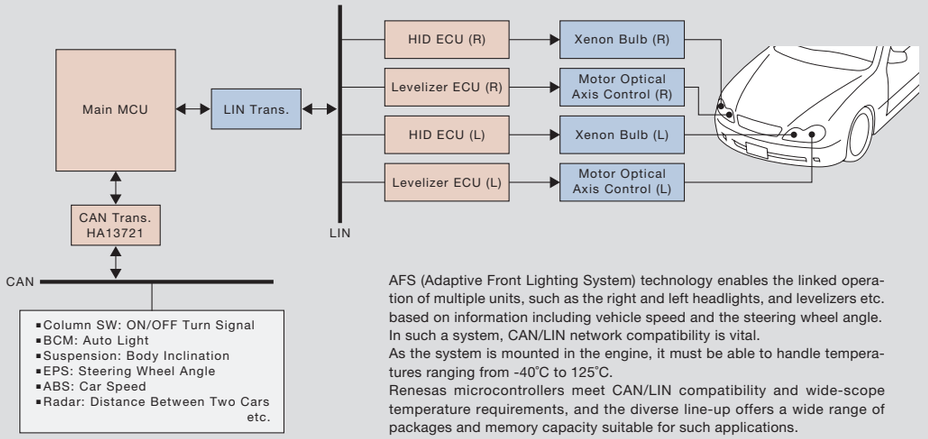

*:Under Planning

## Dashboard

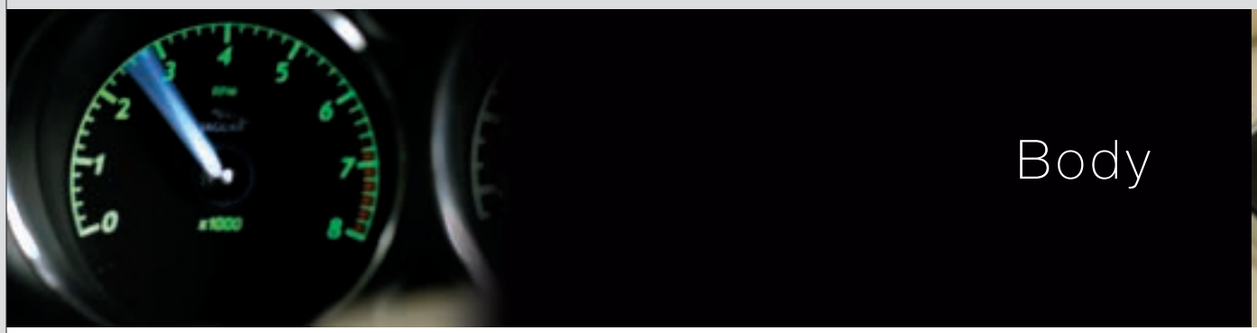
Future dashboard solutions are predominantly platform based, requiring a variety of microcontrollers compatible with software and peripheral devices.
The function to directly drive the gauges through stepping motors and the interface to display vehicle information are also extremely important.
Renesas offers a wide range of applicable products customized for dashboard controls.




## AFS (Adaptive Front Lighting System)

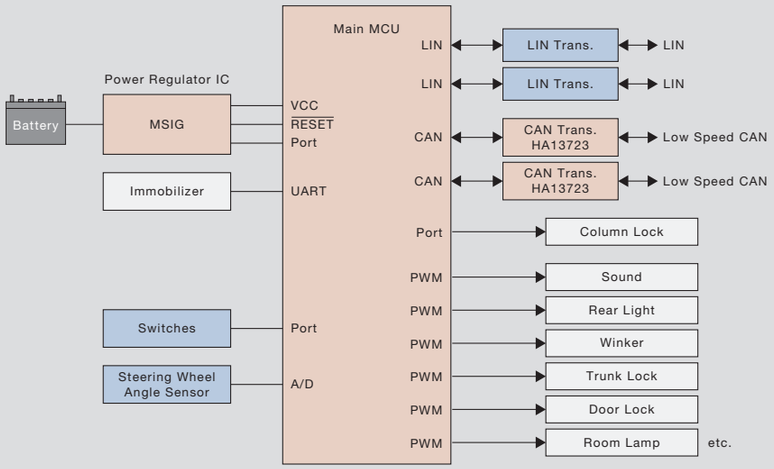



AFS (Adaptive Front Lighting System) technology enables the linked operation of multiple units, such as the right and left headlights, and levelizers etc. based on information including vehicle speed and the steering wheel angle.
In such a system, CAN/LIN network compatibility is vital.
As the system is mounted in the engine, it must be able to handle temperatures ranging from -40˚C to 125˚C.
Renesas microcontrollers meet CAN/LIN compatibility and wide-scope temperature requirements, and the diverse line-up offers a wide range of packages and memory capacity suitable for such applications.



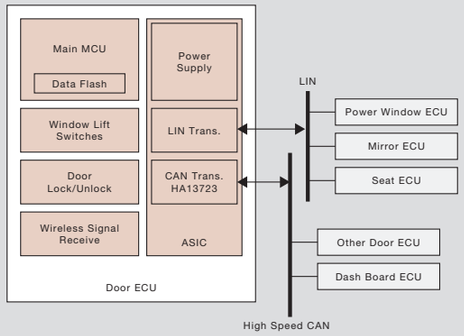
## BCM (Body Control Module)

BCM is a module that incorporates the functions of various types of lamps and door locks. It also serves as the gateway of CAN and LIN.
Characteristics required of BCM include compatibility with CAN/LIN networks, flexibility in optimal package/memory design for specific needs, low EMI to suppress radio noise interference from electric wires installed throughout the car body, and reduced current consumption, to save battery power during standby.
With a wide assortment of CAN/LIN MCUs, RENESAS is ready to meet various requirements for car body control.



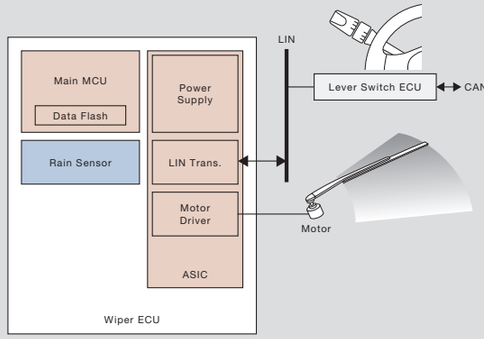

## Door

Continuing advances in module integration have led to requirements for various controls and communications in the door module ECU.
Renesas offers a wide-ranging line up of body microcontrollers which support integration on various scales.
It is also possible to develop customized ASICs to include power source and communications drivers etc. in one package, thus contributing to miniaturization of the ECU.




## Wiper

When it comes to a miniature microcontroller for wiper control, Renesas' high performance body MCU product line-up is the ideal place to look.
Although tiny, the MCU has a 16-bit CPU core, ensuring smooth motor control.



# F-ZTAT series MCU

F-ZTAT Flash & Flexible

F-ZTAT Flash & Flexible

- Flexible mounting of NV memory technology to suit diverse MCU needs
- Wide-ranging flash microcontroller product line-up, providing flexible solutions for customer needs
- Flexible choice of flash microcontroller development support environments

## Diverse Flash MCUs

### High end

**Pursuit of performance**

- High-speed (100MHz or higher)
- Large capacity F-ZTAT (2-byte or over)
- High speed write performance
- Reliability

MONOS type floating gate

### Middle range

**Total balance**

- Performance
- Cost
- Functions
- Noise resistance
- Security
- Reliability/performance

(NOR) type floating gate HND

### Low end

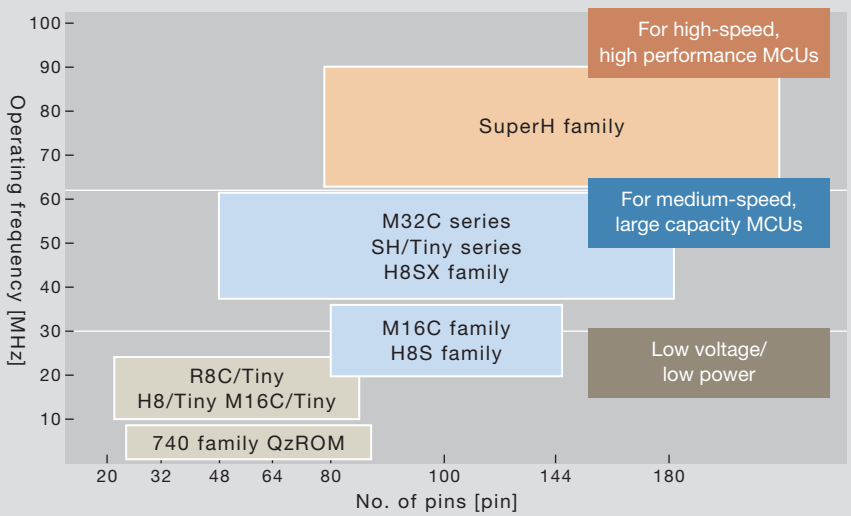
**Pursuit of cost**

- Low energy consumption
- Low leakage, low voltage operation capability (1.8V)
- Ultra small package
- Reliability

Low voltage type low-cost MONOS Qz ROM

## Wide-ranging product line-up

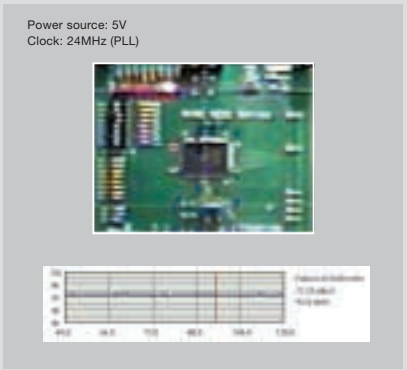
The Renesas Flash MCU F-ZTAT series boasts a line-up of more than 200 product models, from fast and large-capacity models to compact ones.
These offer flexible solutions to growing and diversifying software applications.



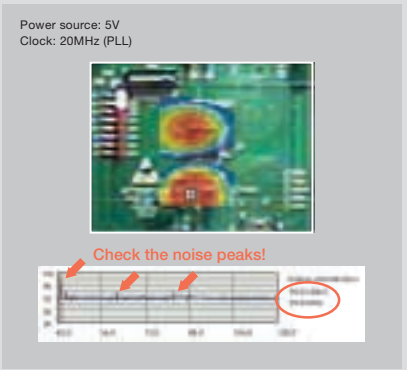
## Low EMI + High EMS Characteristics

Renesas takes optimum EMI/EMS performance into account in its MCU design. Our careful attention at this stage drastically reduces the cost of EMI/EMS countermeasures.

Renesas MCU

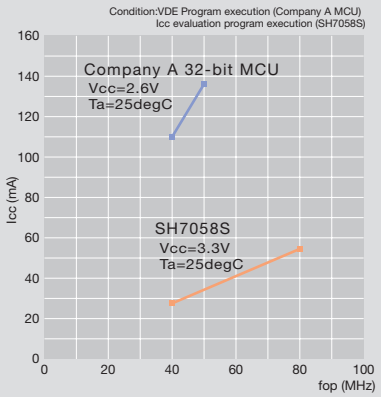


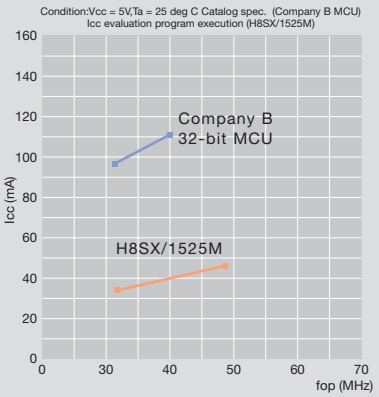

Other company MCU

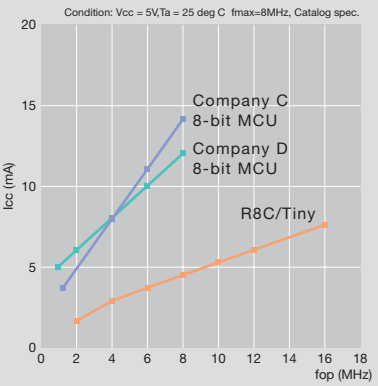



## Low Power Consumption

Renesas MCUs realize process advances at the same time as achieving reductions in power consumption. Low power consumption design is made easy.



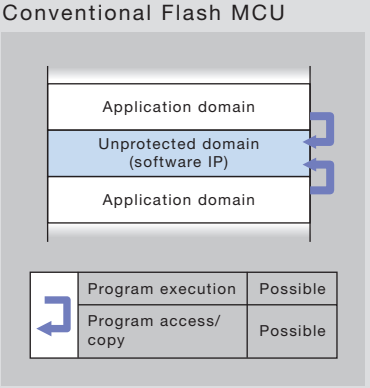




## Security Function Trusted FLASH

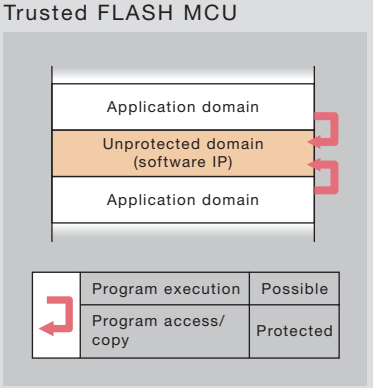
This function offers complete protection of a specified domain in the built-in MCU flash memory.
This prevents illegal copying of the software IP incorporated in the protected domain.

Note: We plan to develop Trusted FLASH as a standard function in the Renesas F-ZTAT MCUs.

Conventional Flash MCU




Trusted FLASH MCU



# Wide-ranging Peripheral Functions

## Communications Functions

### CAN
- Bosch 2.0B compatible
- NRZ type/Broadcast type
- Maximum transmission speed 1Mbps

### FlexRay
- Maximum 10 Mbps high-speed connection
- Complete duplexed network structure to ensure high reliability communication

### LIN
- LIN connection possible using timer RA and/or UART0
- Master mode: Synch break and bus conflict detection
- Slave mode: Synch break detection, synch field measurement, synch break and synch field signal UART0 input control function, bus conflict detection

### SSU Clock synchronous serial interface with chip select
- Clock synchronous communication mode or 4-line bus communication mode (inc. two-way communication mode) selection possible
- Master and slave device selection possible
- Transmission and reception buffer structure enables continuous serial data transmission and reception
- 8 to 16-bit character length

## High Performance Timers

### Input capture (time measurement function)
- When a trigger signal occurs, this function saves the timer value to the time measurement resistor and generates an interrupt

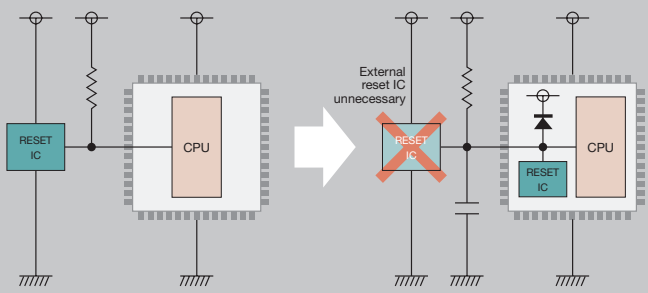
### Output compare (wave form generation function)
- This function generates an interrupt when the base timer and wave form generating resistor values match, and creates a PWM wave form

### PWM output
- A 6-phase PWM wave form necessary to control the inverter can be output using resistor settings only
- Brushless DC motor (AC synchronous motor) can easily be controlled through resistor settings and signal inputs from Hall sensors

## New Reset Function (On-Chip Reset Circuit)

### Low voltage detection
- Voltage-low interrupt (switch to choose between enabled/disenabled): insufficient power source voltage can be determined using switch, without external circuit

### Power on reset
- Built-in reset circuit (switch to choose between enabled/disenabled): prevents malfunction at lower than operational voltage



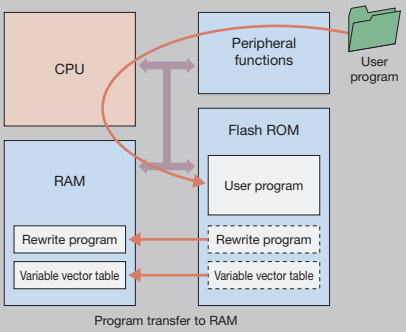
Please refer to the Selection Map for details of functions embedded in each MCU.

## Other Functions

### Built-in flash memory functions

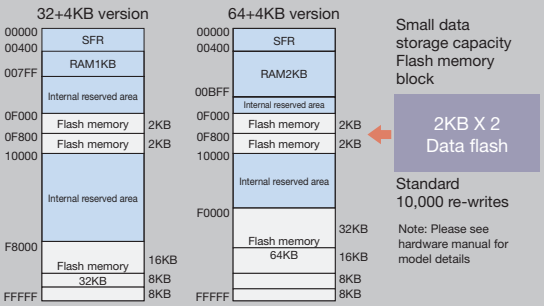
#### CPU re-write mode

User domain delete/write, using flash re-write program created by the customer.



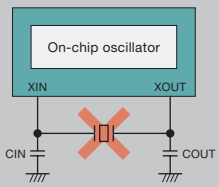

#### Data flash

Small-block flash memory, known as data flash is embedded in addition to program flash memory. This domain can be erased up to 10,000 times, and can be used to replace an external EEPROM.




### High precision on-chip oscillator

The built-in high-precision, high-speed on-chip oscillator enables LIN connection without a crystal oscillator or ceramic resonator connected to the chip.



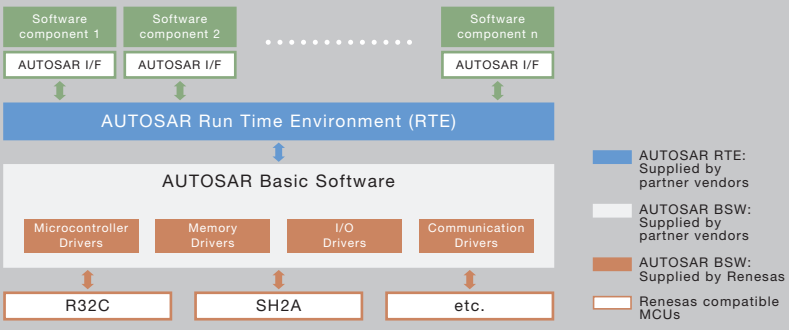

### Watchdog timer

- Operates after MCU reset release
- Operates using independent count source (on-chip oscillator operated)
- Count source cannot be switched, continuous feed is possible
- This function removes the need for an external watchdog timer, and reduces the mounting area and costs.

## AUTOSAR Compatibility

### Provision of basic software

Renesas has continuously developed basic software (BSW) in compliance with AUTOSAR specifications, and supplies software in collaboration with partner vendors.




## CAN Conformance Test

### Third-Party Conformance Test

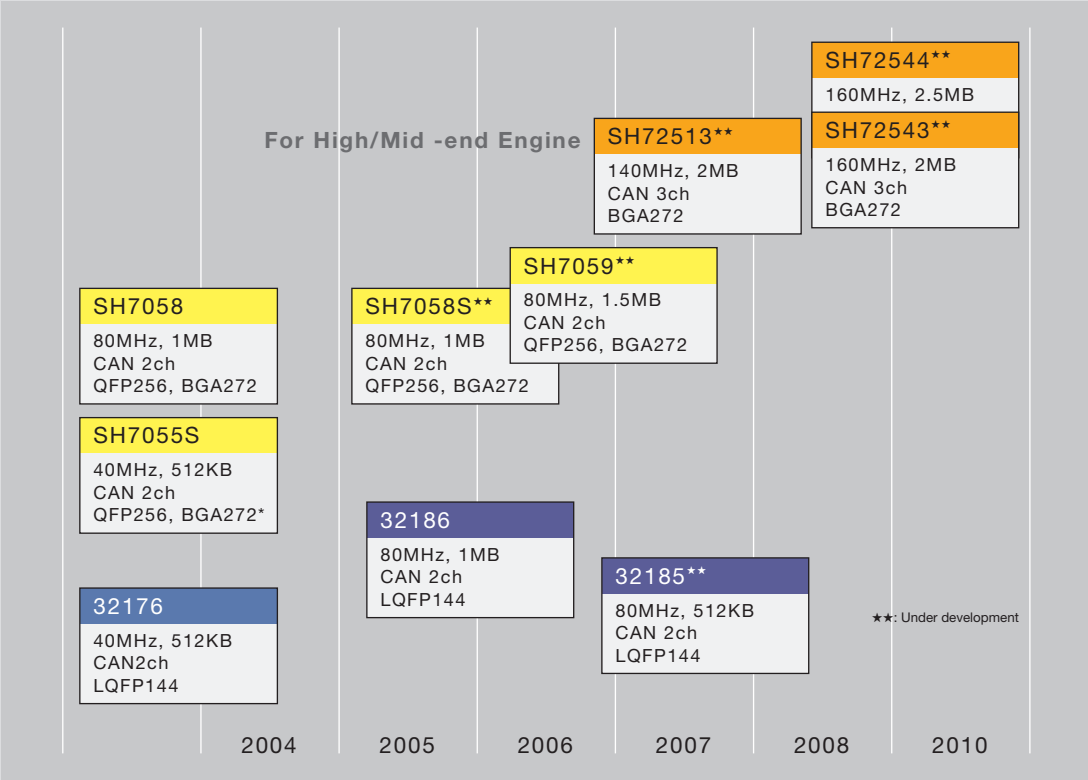
Compliant with ISO 16845(1) CAN conformance test

### Renesas Original Evaluation

In addition to conformance test under ISO 16845, Renesas products have been evaluated by Renesas' original test method.

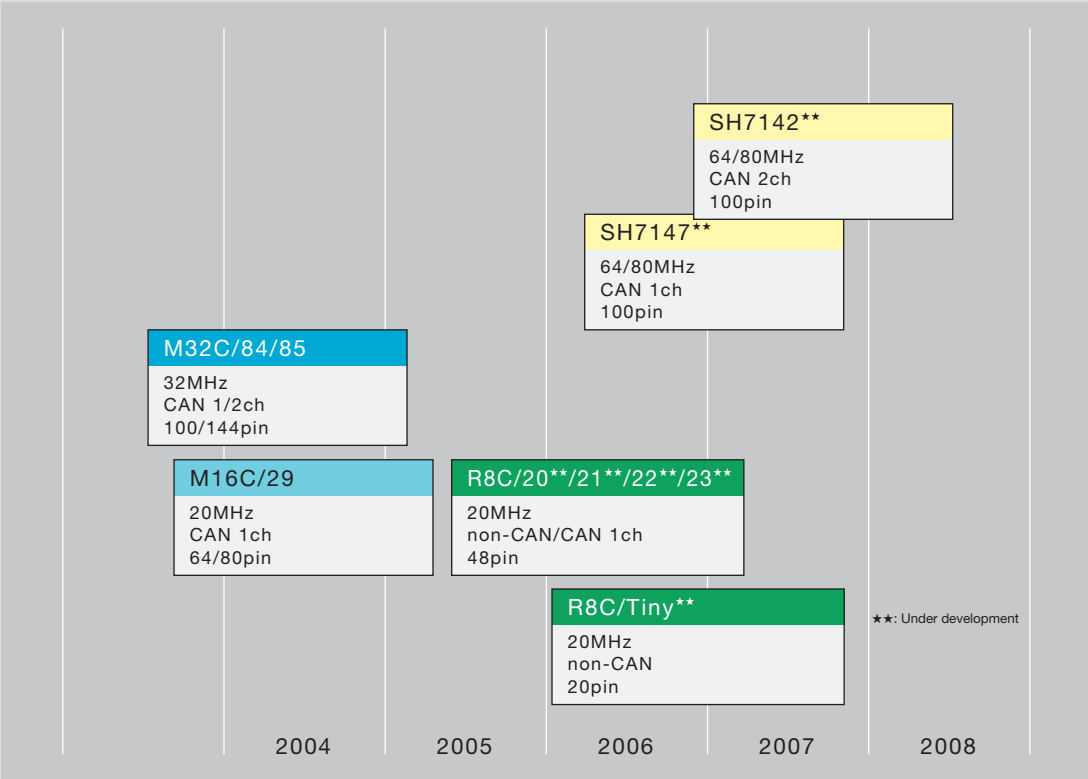
Notes (1): Conformance test item in ISO 11898-1 standardized CAN2.0B.

## Powertrain Systems

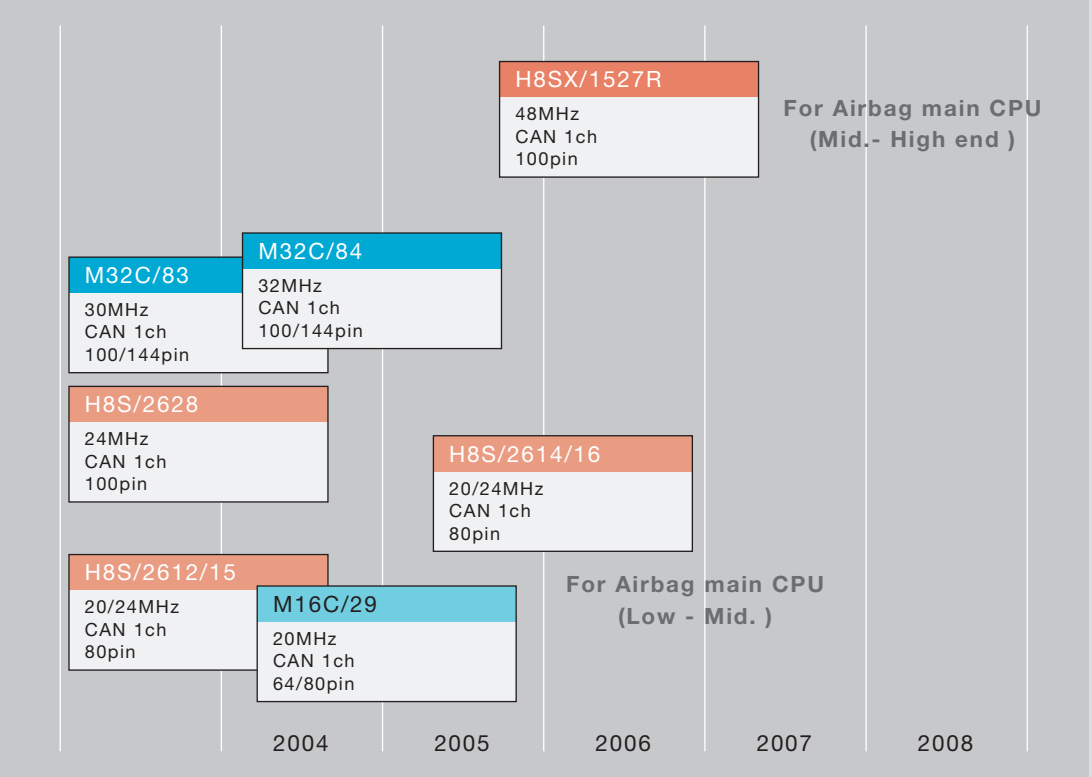



## Motor Control

(EPS, ESC and HEV)

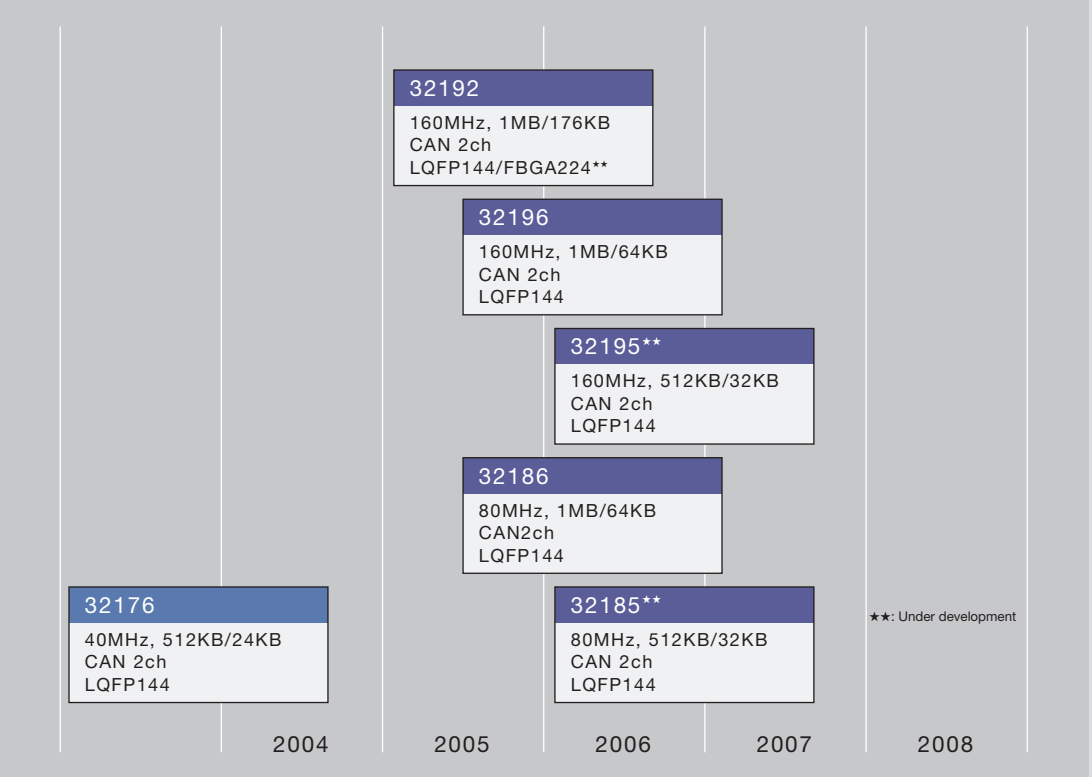


# Safety Applications

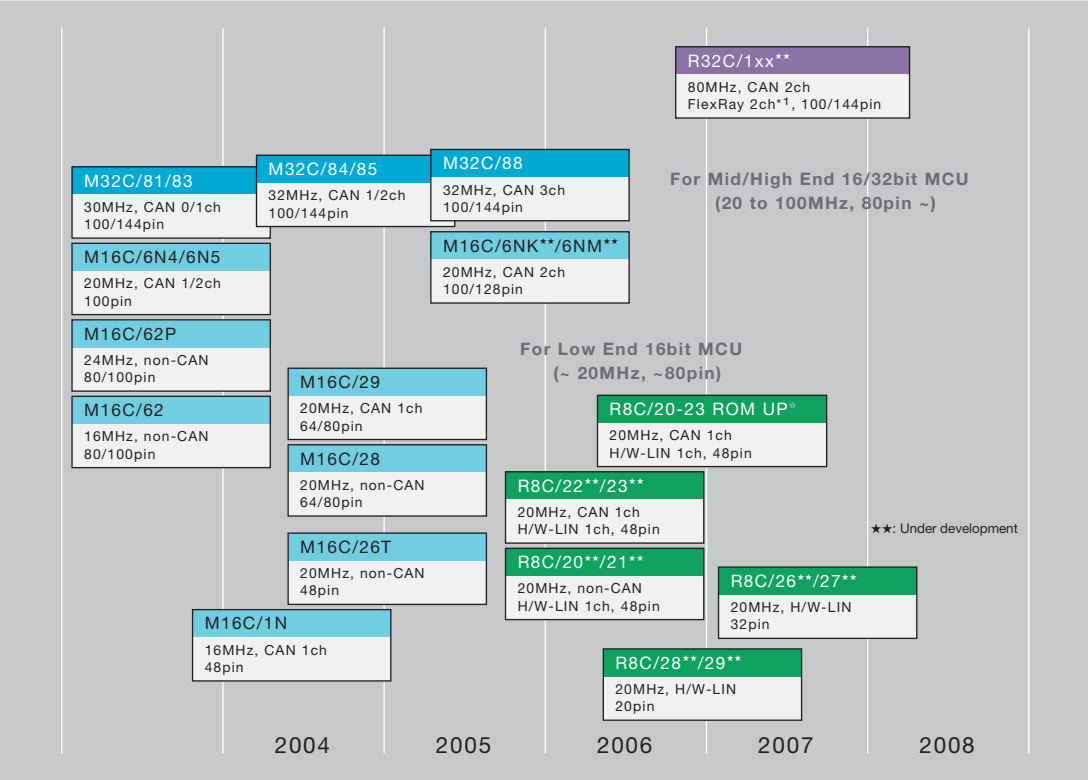



## Active Safety

(ACC, LDWS and OD)

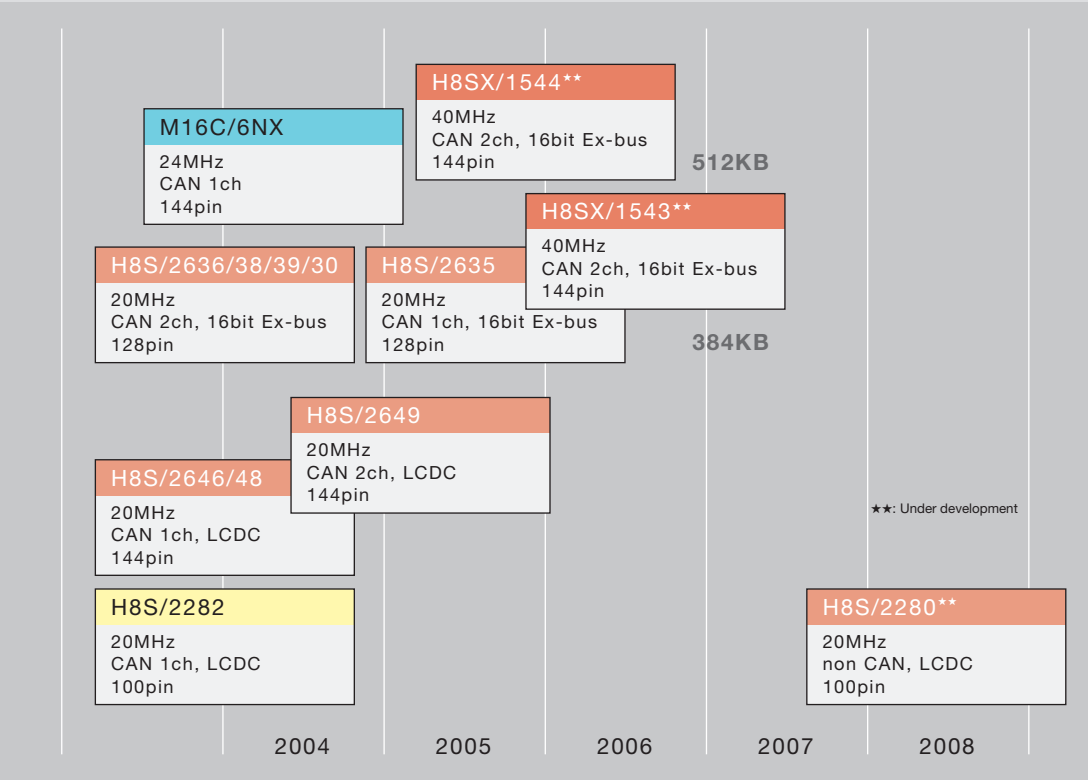


## Body Systems




*1 : FlexRay 2ch: One is for Ch.A, and another is for Ch.B.

## Dashboard Applications



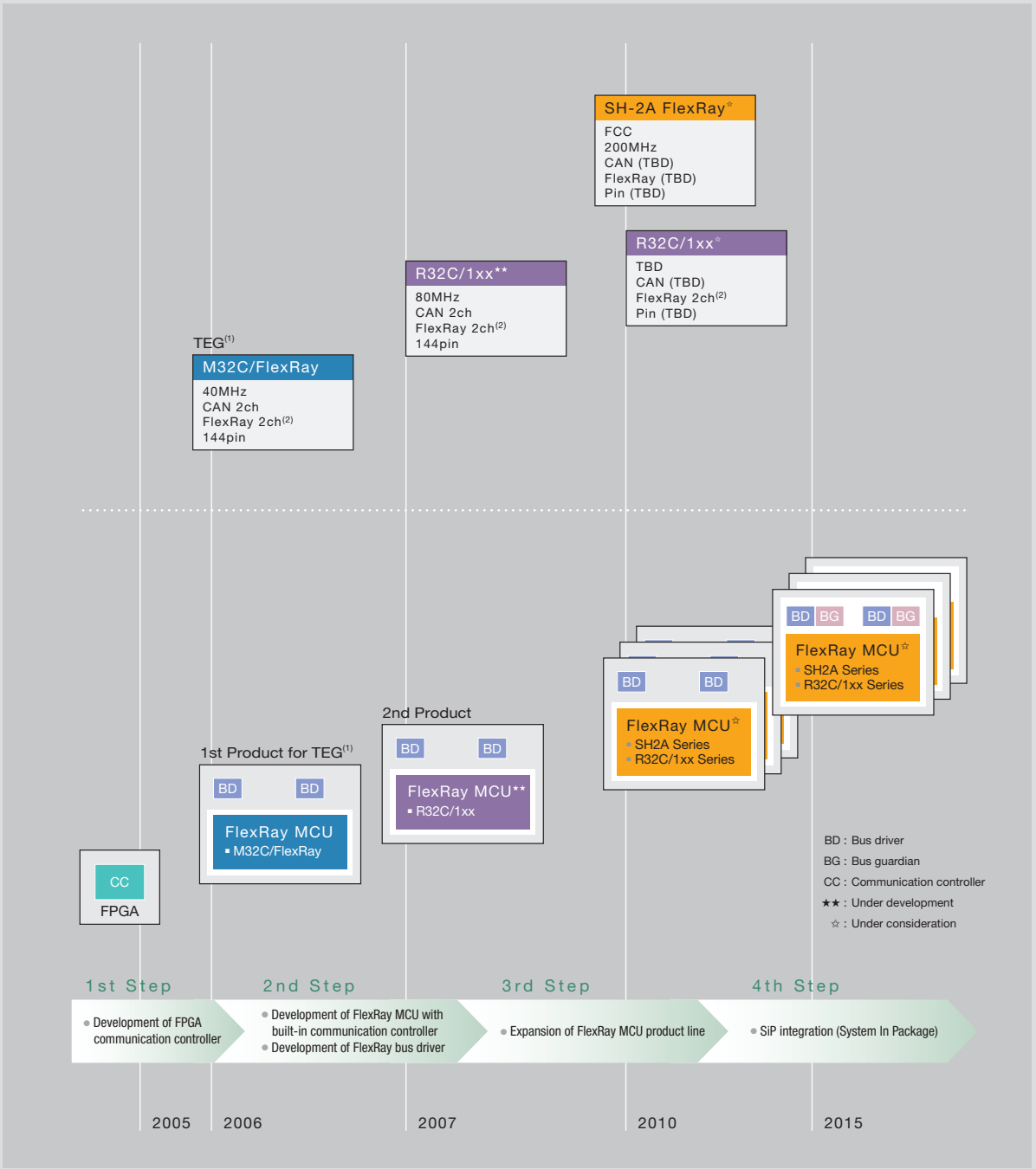
# FlexRay (X-by-Wire)

## Features of FlexRay (X-by-Wire)

**Superior flexibility**
- Supports two TDMA communication methods: Static segment and Dynamic segment communication
- Selectable bus type, star type or hybrid type topology

**High reliability**
- Duplexed network structure
- Duplexed supervision of communication schedules by communication controller and bus guardian
- Guaranteed message communication even during full traffic
- Substantial communication synchronizing functions (bit correction, offset correction and rate correction)

**Wide bandwidth**
- Bus bandwidth of up to 10Mbps




Notes(1) TEG: Test Element Group  Notes(2) FlexRay 2ch: One for channel A, and the other for channel B.

# ASRB (Safe-by-Wire Plus)

## Features of ASRB (Safe-by-Wire Plus)

**■ Specialized protocol for airbag systems (firing and sensor use)**

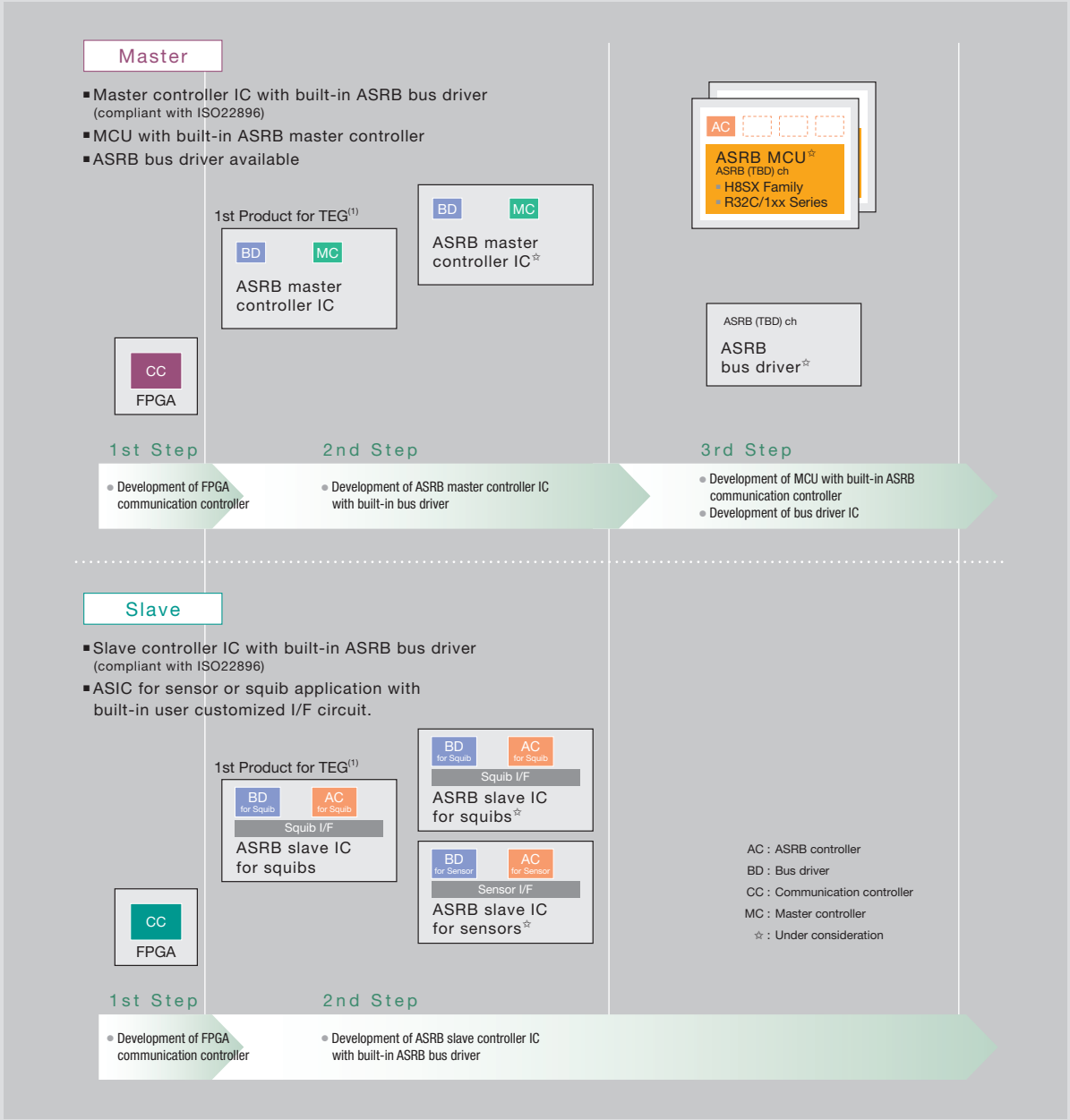
- Can control up to 12 firing devices per frame
- Capable of high-speed polling of sensor data
- ISO standardization under way (ISO22896), based on ASRB 2.0 specifications

**■ Power supply superimposed 2-wire system differential bus**

- Master/slave system
- Power supplied from master to slaves via bus
- Supports 20kHz to 160kHz communication speeds
- Supports a bus-type daisy chain configuration
- Automatic baud rate modulation by slave

**■ High reliability**

- Capable of real-time recovery from bus shorts and disconnection, thanks to the floating bus adopted
- Inhibition of accidental firing




Notes(1) TEG: Test Element Group

# Selection Map

SH7050 series — 29
SH7047, SH7147 series — 30
M32R/ECU series — 31
M32C/80 series — 32
M16C/60 series — 36
M16C/Tiny series — 40
M16C/10 series — 42
R8C/Tiny series — 43
H8SX/1500 series — 46
H8S/2600 series — 47
H8S/2200 series — 51
H8/300H Tiny series — 52

## SH7050 series

| Series | | SH7050 | | |
|---|---|---|---|---|
| Group | | SH7055 | SH7058 | SH7058S |
| Part No. | | HD64F7055S | HD64F7058F | R4F70580S |
| Memory | ROM | 512K | 1M | |
| | RAM | 32K | 48K | |
| | ROM Type (1) | F | | |
| | Cache Memory | – | | |
| | Program Security | – | | |
| CPU | CPU | SH-2E core | | |
| | Basic Instructions | 79 | | |
| | Minimum Instruction Execution Time (ns) | 25 (@40MHz) | 12.5 (@80MHz) | |
| | Dhrystone Performance | 52MIPS (40MHz) | 104MIPS (80MHz) | |
| | Multiplier | 32 x 32→64 | | |
| | Multiply -Accumulate Instruction | 32 x 32 + 64→64 | | |
| | Barrel Shifter | – | | |
| | FPU | Yes | | |
| | MMU | – | | |
| DMA | DMAC (Channels) | 4 | | |
| | DTC/DMACII | – | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | |
| | Bus State Controller | Yes | | |
| | Bus Structure | SRAM | | |
| | SDRAM Controller | – | | |
| | DRAM Controller | – | | |
| | PCI Controller | – | | |
| | Endian Conversion | – | | |
| | Host Interface | – | | |
| Clock | Clock Generation Circuit | 1 circuit | | |
| | PLL | Yes | | |
| | RTC | – | | |
| | Oscillation Stop Detection | – | | |
| | Frequency Divider | – | | |
| | Power Save | Sleep / Software standby / Module standby / Hardware standby | | |
| Voltage Detection | Power-On Reset / POR | – | | |
| A/D Converter | Resolution x Channels | 10-bit x 32 | | |
| | Sample and Hold | Yes (3) | | |
| | Multi-Channel Sample and Hold | – | | |
| D/A Converter | Resolution x Channels | – | | |
| Timer | 8-bit Timer | – | | |
| | 16-bit Timer | 65 (ATU-II) | | |
| | 32-bit Timer | – | | |
| | Input Capture | ATU-II | | |
| | Output Compare | ATU-II | | |
| | PWM Output | ATU-II | | |
| | Event Counter | ATU-II | | |
| | 2-Phase Encoder Input | – | | |
| | 3-Phase Inverter Control | – | | |
| Watchdog Timer | | 1 | | |
| Serial Interface | Clock Sync. / Clock Async. | 5 | | |
| | Clock Sync. Only | – | | |
| | Clock Async. Only | – | | |
| I²C-bus | | – | | |
| Smart Card/ SIM | | – | | |
| SSU / Special Serial I/O | | – | | 2 |
| CAN | Channels | 2 | | |
| | Message Box | 16 x 2 | 32 x 2 | |
| Ethernet | | – | | |
| USB HOST | | – | | |
| USB Function | | – | | |
| IrDA | | – | | |
| LCD | | – | | |
| I/O Ports | Input Only (Numbers) | – | | |
| | CMOS I/O (Numbers) | 149 | | |
| | High Voltage Port (Numbers) | – | | |
| | N-Channel Open Drain Port (Numbers) | – | | |
| | High Current Drive Port | – | | |
| | Pull-Up Resistor | – | | |
| External Interrupt pins | | 9 | | |
| Debug Function | Boundary Scan / JTAG | – | Yes | |
| | On-Chip Debug | – | | |
| | On-Board Flash Program | Yes | | |
| Other Functions | ROM Correction Function | – | | |
| PKG Code | | PRQP0256KB-A (FP-256H), PBGA2121-272 | | |
| Operating Frequency / Supply Voltage | | 40MHz/3.3V (external I/O : 5.0V, bus : 3.3V) | 80MHz/3.3V (external I/O : 5.0V, bus : 3.3V) | |
| Operating Ambient Temperature (˚C) | | –40 to 125 | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## SH7047, SH7147 series

| Series | | SH7047 | | SH7147 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | | SH7047 | SH7049 | SH7147 | | SH7142 | | | |
| Part No. | | HD64F7047F | HD6437049XXXF | R5F71474AK64FPV** | R5F71474BJ80FPV** | R5F71424AK64FPV** | R5F71424BJ80FPV** | R5F71426AK64FPV** | R5F71426BJ80FPV** |
| Memory | ROM | 256K | 128K | 256K | | | | 512KB | |
| | RAM | 12K | 8K | 12K | 16K | 12K | 16K | | |
| | ROM Type (1) | F | M | F | | | | | |
| | Cache Memory | – | | | | | | | |
| | Program Security | Yes | | | | | | | |
| CPU | CPU | SH-2 core | | | | | | | |
| | Basic Instructions | 62 | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 20 (@50MHz) | | 15.6 (@64MHz) | 12.5 (@80MHz) | 15.6 (@64MHz) | 12.5 (@80MHz) | 15.6 (@64MHz) | 12.5 (@80MHz) |
| | Dhrystone Performance | 65MIPS (50MHz) | | – | | | | | |
| | Multiplier | 32 x 32→64 | | | | | | | |
| | Multiply -Accumulate Instruction | 32 x 32 + 64→64 | | | | | | | |
| | Barrel Shifter | – | | | | | | | |
| | FPU | – | | | | | | | |
| | MMU | – | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | |
| | DTC/DMACII | DTC | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 256K | | 128K | | | | | |
| | Bus State Controller | Wait state (1 to 15 waits, can be extended with an external signal) | | Wait state (1 to 24 waits, can be extended with an external signal) | | | | | |
| | Bus Structure | Separate bus (8-bit) | | | | | | | |
| | SDRAM Controller | – | | | | | | | |
| | DRAM Controller | – | | | | | | | |
| | PCI Controller | – | | | | | | | |
| | Endian Conversion | – | | | | | | | |
| | Host Interface | – | | | | | | | |
| Clock | Clock Generation Circuit | 1 circuit | | | | | | | |
| | PLL | Yes | | | | | | | |
| | RTC | – | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2) | | 1/n (n=1, 2, 3, 4, 8) | | | | | |
| | Power Save | Sleep / Software standby / Module standby | | | | | | | |
| Voltage Detection | Power-On Reset / POR | – | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 x 2 circuits | | 12-bit x 8 x 2 circuits | | | | | |
| | Sample and Hold | Yes | | | | | | | |
| | Multi-Channel Sample and Hold | Yes (2 unit) | | Yes (6 unit) | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | |
| Timer | 8-bit Timer | – | | | | | | | |
| | 16-bit Timer | 8 (MMT x 1, MTU x 5, CMT x 2) | | 8 (MTU2 x 5, MTU2S x 3, CMT x 2) | | | | | |
| | 32-bit Timer | – | | | | | | | |
| | Input Capture | MTU x 16 | | MTU2 x 12, MTU2S x 9 | | | | | |
| | Output Compare | MTU x 16 | | MTU2 x 12, MTU2S x 6 | | | | | |
| | PWM Output | MTU x 16 | | MTU2 x 12, MTU2S x 6 | | | | | |
| | Event Counter | MTU x 4 | | MTU2S x 3 | | | | | |
| | 2-Phase Encoder Input | MTU x 2 (TCLKA/TCLKB, TCLKC/TCLKD) | | MTU2 x 2 (TCLKA/TCLKB, TCLKC/TCLKD) | | | | | |
| | 3-Phase Inverter Control | MTU, MMT x 2 | | MTU2, MTU2S x 2 | | | | | |
| Watchdog Timer | | 1 | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (SCI) | | | | | | | |
| | Clock Sync. Only | – | | | | | | | |
| | Clock Async. Only | – | | | | | | | |
| $I^2C$-bus | | – | | | | | | | |
| Smart Card/ SIM | | – | | | | | | | |
| SSU / Special Serial I/O | | – | | 1 (SSU) | | | | | |
| CAN | Channels | 1 | | 2 | | | | | |
| | Message Box | 32 | | 16 | | 32 (16 x 2) | | | |
| Ethernet | | – | | | | | | | |
| USB HOST | | – | | | | | | | |
| USB Function | | – | | | | | | | |
| IrDA | | – | | | | | | | |
| LCD | | – | | | | | | | |
| I/O Ports | Input Only (Numbers) | 16 | | | | | | | |
| | CMOS I/O (Numbers) | 53 | | 57 | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | |
| | High Current Drive Port | 12 | | – | | | | | |
| | Pull-Up Resistor | – | | | | | | | |
| External Interrupt pins | | 5 | | | | | | | |
| Debug Function | Boundary Scan / JTAG | Yes | – | | | | | | |
| | On-Chip Debug | Yes (H-UDI) | – | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | |
| PKG Code | | PRQP0100KB-A (FP-100M) | | PLQP0100KB-A (FP-100UV) | | | | | |
| Operating Frequency / Supply Voltage | | 50MHz/5.0V | | 64MHz/ 3.3V, 5.0V | 80MHz/ 5.0V | 64MHz/ 3.3V, 5.0V | 80MHz/ 5.0V | 64MHz/ 3.3V, 5.0V | 80MHz/ 5.0V |
| Operating Ambient Temperature (°C) | | –20 to 75, –40 to 85 | | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## M32R/ECU series

| Group | | 32176 | | | | | | 32185 | 32186 | 32192 | | | | | 32195 | | | 32196 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M32176F2TFP | M32176F2VFP | M32176F3TFP | M32176F3VFP | M32176F4TFP | M32176F4VFP | M32185F4VFP** | M32186F8VFP* | M32192F8TFP | M32192F8UFP | M32192F8VFP | M32192F8TWG** | M32192F8UWG** | M32192F8WWG** | M32195F4TFP** | M32195F4UFP** | M32195F4VFP** | M32196F8TFP* | M32196F8UFP* | M32196F8VFP* |
| Memory | ROM(Bytes) | 256K | | 384K | | 512K | | | 1M | | | | | | | 512K | | | 1M | | |
| | RAM(Bytes) | 24K | | | | | | 32K | 64K | 176K | | | | | | 32K | | | 64K | | |
| | ROM Type (1) | F | | | | | | | | | | | | | | | | | | | |
| | Data Flash | Yes (option) | | | | | | | | | | | | | | | | | | | |
| | Program Security | Yes (Flash Memory Protect ID, Protect via FP Terminal, Protect via FENTRY Bit, Protect via Lock Bit) | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | M32R CPU core | | | | | | M32R-FPU core (on-chip single-precision FPU) | | | | | | | | | | | | | |
| | Basic Instructions | 83 | | | | | | 100 | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 25 (@40MHz) | 31.25 (@32MHz) | 25 (@40MHz) | 31.25 (@32MHz) | 25 (@40MHz) | 31.25 (@32MHz) | 12.5 (@80MHz) | | 6.25 (@160MHz) | | 7.8125 (@128MHz) | 6.25 (@160MHz) | | 7.8125 (@128MHz) | 6.25 (@160MHz) | | 7.8125 (@128MHz) | 6.25 (@160MHz) | | 7.8125 (@128MHz) |
| | Multiplier | 16 x 32→48 | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 32 + 56→56 | | | | | | | | | | | | | | | | | | | |
| | Barrel Shifter | Yes | | | | | | | | | | | | | | | | | | | |
| | FPU | – | | | | | | Yes | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 10 | | | | | | | | | | | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 2M | | | | | | 31M | | | | | | | | | | | | | |
| | External Bus Interface | Wait controller (1 to 4 wait cycles inserted + prolonged by external WAIT signal input) | | | | | | Wait controller (0 to 15 wait cycles inserted + prolonged by external WAIT signal input) | | | | | | | | | | | | | |
| | Bus Structure | Separate bus (16-bit) | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Oscillation Circuit, PLL) | | | | | | | | | | | | | | | | | | | |
| | PLL | Yes (4-multiplier) | | | | | | Yes (8-multiplier) | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 16 | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | |
| | Multi-Channel Sample and Hold | – | | | | | | Yes (Simultaneous Sampling Function) | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit | 29 (TOP x 11, TIO x 10, TMS x 8) | | | | | | 31 (TOP x 11, TIO x 10, TMS x 8, TID x 2) | | | | | | | | | | | | | |
| | 24-bit | – | | | | | | 16 (TOU) | | | | | | | | | | | | | |
| | 32-bit | 8 (TML) | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 16 (shared with TMS, TML) | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 10 (shared with TIO) | | | | | | 26 (shared with TIO, TOU) | | | | | | | | | | | | | |
| | Event Counter | 4 (shared with TMS, TIO) | | | | | | 6 (shared with TMS, TIO, TID) | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | – | | | | | | 2 (shared with TID) | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | 2 (shared with TOU) | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 (SIO0, SIO1) | | | | | | 4 (SIO0, SIO1, SIO4, SIO5) | | | | | | | | | | | | | |
| | Clock Async. Only | 2 (SIO2, SIO3) | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 2 | | | | | | | | | | | | | | | | | | | |
| | Message Box | 16 | | | | | | 32 | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 (Input level switching function) | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 95 (Input level switching function) | | | | | | 96 (Input level switching function, Output drive capability setting function, Noise canceller control function) | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | 27 | | | | | | | | | | | | | |
| Debug Function | Boundary Scan/JTAG | Yes | | | | | | | | | | | | | | | | | | | |
| | On-Chip Debug | Yes (Scalable debug interface, Real-time debugger) | | | | | | Yes (Scalable debug interface, Real-time debugger, Non-break debug) | | | | | | | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | | | | | | | | | | | | | |
| Other Functions | Other | – | | | | | | Direct RAM I/F | | | | | | | | | | | | | |
| PKG Code | | PLQP0144KA-A (144P6Q-A) | | | | | | | | | | | PLBG0224GA-A (224FHE) | | | PLQP0144KA-A (144P6Q-A) | | | | | |
| Operating Frequency/ Supply Voltage | | 40MHz/ 3.3V or 5.0V single-power-supply | 32MHz/ 3.3V or 5.0V single-power-supply | 40MHz/ 3.3V or 5.0V single-power-supply | 32MHz/ 3.3V or 5.0V single-power-supply | 40MHz/ 3.3V or 5.0V single-power-supply | 32MHz/ 3.3V or 5.0V single-power-supply | 80MHz/3.3V single, 5.0V single or 3.3 and 5.0V dual-power-supply | | 160MHz/ 3.3V single, 5.0V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 128MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single, 5.0V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 128MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single, 5.0V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 128MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single, 5.0V single or 3.3 and 5.0V dual-power-supply | 160MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply | 128MHz/ 3.3V single or 3.3 and 5.0V dual-power-supply |
| Operating Ambient Temperature (°C) | | –40 to 85 (@40MHz) | –40 to 125 (@32MHz) | –40 to 85 (@40MHz) | –40 to 125 (@32MHz) | –40 to 85 (@40MHz) | –40 to 125 (@32MHz) | –40 to 125 | | –40 to 85 (@160MHz) | –40 to 105 (@160MHz) | –40 to 125 (@128MHz) | –40 to 85 (@160MHz) | –40 to 105 (@160MHz) | –40 to 125 (@128MHz) | –40 to 85 (@160MHz) | –40 to 105 (@160MHz) | –40 to 125 (@128MHz) | –40 to 85 (@160MHz) | –40 to 105 (@160MHz) | –40 to 125 (@128MHz) |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M32C/80 series

| Group | | M32C/81 (M32C/81T) | | | | M32C/83 (M32C/83T) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30810MCT-XXXGP | M30810MCV-XXXGP | M30812MCT-XXXGP | M30812MCV-XXXGP | M30833FJTGP | M30833FJVGP | M30835FJTGP | M30835FJVGP |
| Memory | ROM | 128K | | | | 512K | | | |
| | RAM | 10K | | | | 31K | | | |
| | ROM Type (1) | M | | | | F | | | |
| | Data Flash | – | | | | | | | |
| | Program Security | – | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | | |
| CPU | CPU | M32C/80 core | | | | | | | |
| | Basic Instructions | 108 | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 31.3 (@32MHz) | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 48→48 | | | | | | | |
| | Barrel Shifter | Yes | | | | | | | |
| DMA | DMAC (Channels) | 4 | | | | | | | |
| | DTC/DMACII | DMACII (Startup Possible with All Peripheral Function Interrupt Causes) | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | |
| | PLL | Yes | | | | | | | |
| | Subclock | Yes | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16) | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | 10-bit x 34 | | 10-bit x 26 (2 circuits) | | 10-bit x 34 (2 circuits) | |
| | Sample and Hold | Yes | | | | | | | |
| | Multi-Channel Sample and Hold | – | | | | Yes | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | |
| | Input Capture | 5 (Intelligent I/O) | | 12 (Intelligent I/O) | | 5 (Intelligent I/O) | | 12 (Intelligent I/O) | |
| | Output Compare | 8 (Intelligent I/O) | | 20 (Intelligent I/O) | | 10 (Intelligent I/O) | | 28 (Intelligent I/O) | |
| | PWM Output | 13 (Timer A, Intelligent I/O) | | 25 (Timer A, Intelligent I/O) | | 15 (Timer A, Intelligent I/O) | | 33 (Timer A, Intelligent I/O) | |
| | Real-Time Port | 3 (Intelligent I/O) | | 8 (Intelligent I/O) | | 4 (Intelligent I/O) | | 16 (Intelligent I/O) | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) + 2 (Intelligent I/O) | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 7 (UART, Intelligent I/O) | | | | | | | |
| $I^2C$-bus | | 5 (UART) | | | | | | | |
| IEBus | | 6 (UART, Intelligent I/O) | | | | | | | |
| Smart Card/ SIM | | 5 (UART) | | | | | | | |
| SSU/ Special Serial I/O | | 5 (UART) | | | | | | | |
| CAN | Channels | 1 | | | | | | | |
| | Message Box | 16 | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | |
| X/Y Converter | | Yes | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | 121 | | 85 | | 121 | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | |
| | Pull-Up Resistor | 85 | | 121 | | 85 | | 121 | |
| External Interrupt pins | | 11 | | | | | | | |
| Debug Function | On-Chip Debug | – | | | | Yes | | | |
| | On-Board Flash Program | – | | | | Yes | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A/FP-100U), PLQP0144KA-A (144P6Q-A) | | | | | | | |
| Operating Frequency/ Supply Voltage | | 32MHz/4.2 to 5.5V | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M32C/80 series

| Group | | M32C/84 (M32C/84T) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30840MCT-XXXGP* | M30840MCU-XXXGP** | M30842MCT-XXXGP* | M30842MCU-XXXGP** | M30843MGT-XXXGP* | M30843MGU-XXXGP** | M30843MWT-XXXGP* | M30843MWU-XXXGP** | M30843MHT-XXXGP* | M30843MHU-XXXGP** | M30843FHTGP | M30843FHUGP | M30843FJTGP | M30843FJUGP | M30845MGT-XXXGP* | M30845MGU-XXXGP** | M30845MWT-XXXGP* | M30845MWU-XXXGP** | M30845MHT-XXXGP* | M30845MHU-XXXGP** | M30845FHTGP | M30845FHUGP | M30845FJTGP | M30845FJUGP |
| Memory | ROM | 128K | | | | 256K | | 320K | | 384K | | 384K + 4K | | 512K + 4K | | 256K | | 320K | | 384K | | 384K + 4K | | 512K + 4K | |
| | RAM | 10K | | | | 20K | | 24K | | | | | | | | 20K | | 24K | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | F | | | | M | | | | | | F | | | |
| | Data Flash | – | | | | | | | | | | Yes (4K) | | | | – | | | | | | Yes (4K) | | | |
| | Program Security | – | | | | | | | | | | Yes<br>Yes (ID Code Check Function, ROM Code Protect Function) | | | | – | | | | | | Yes<br>Yes (ID Code Check Function, ROM Code Protect Function) | | | |
| CPU | CPU | M32C/80 core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 108 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 31.3 (@32MHz) | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 48→48 | | | | | | | | | | | | | | | | | | | | | | | |
| | Barrel Shifter | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| | DTC/DMACII | DMACII (Startup Possible with All Peripheral Function Interrupt Causes) | | | | | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | 10-bit x 34 | | 10-bit x 26 | | | | | | | | | | 10-bit x 34 | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Multi-Channel Sample and Hold | – | | | | | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 8 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | 8 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 13 (Timer A, Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | Real-Time Port | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) + 1 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 6 (UART, Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| IEBus | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | | | | | | | | | | | | | |
| X/Y Converter | | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | 121 | | 85 | | | | | | | | | | 121 | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 85 | | 121 | | 85 | | | | | | | | | | 121 | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | – | | | | | | | | | | Yes | | | | – | | | | | | Yes | | | |
| | On-Board Flash Program | – | | | | | | | | | | Yes | | | | – | | | | | | Yes | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | – | | | | Yes | | | | | | – | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A/FP-100U), PLQP0144KA-A (144P6Q-A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 32MHz/4.2 to 5.5V | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M32C/80 series

| Group | | M32C/85 (M32C/85T) | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30853MGT-XXXGP* | M30853MGU-XXXGP** | M30853MWT-XXXGP* | M30853MWU-XXXGP** | M30853FWTGP | M30853FWUGP | M30853MHT-XXXGP* | M30853MHU-XXXGP** | M30853FHTGP | M30853FHUGP | M30853FJTGP | M30853FJUGP | M30855MGT-XXXGP* | M30855MGU-XXXGP** | M30855MWT-XXXGP* | M30855MWU-XXXGP** | M30855FWTGP | M30855FWUGP | M30855MHT-XXXGP* | M30855MHU-XXXGP** | M30855FHTGP | M30855FHUGP | M30855FJTGP | M30855FJUGP |
| Memory | ROM | 256K | | 320K | | 320K + 4K | | 384K | | 384K + 4K | | 512K + 4K | | 256K | | 320K | | 320K + 4K | | 384K | | 384K + 4K | | 512K + 4K | |
| | RAM | 20K | | 24K | | | | | | | | | | 20K | | 24K | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | M | | F | | | | M | | | | F | | M | | F | | | |
| | Data Flash | – | | | | Yes (4K) | | – | | Yes (4K) | | | | – | | | | Yes (4K) | | – | | Yes (4K) | | | |
| | Program Security | – | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | – | | Yes (ID Code Check Function, ROM Code Protect Function) | | | | – | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | – | | Yes (ID Code Check Function, ROM Code Protect Function) | | | |
| CPU | CPU | M32C/80 core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 108 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 31.3 (@32MHz) | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 48→48 | | | | | | | | | | | | | | | | | | | | | | | |
| | Barrel Shifter | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| | DTC/DMACII | DMACII (Startup Possible with All Peripheral Function Interrupt Causes) | | | | | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | | | | | | | 10-bit x 34 | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Multi-Channel Sample and Hold | – | | | | | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 8 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | 8 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 13 (Timer A, Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | Real-Time Port | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) + 1 (Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 6 (UART, Intelligent I/O) | | | | | | | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| IEBus | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 5 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 16 x 2 | | | | | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | | | | | | | | | | | | | |
| X/Y Converter | | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | | | | | | | | | | | 121 | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 85 | | | | | | | | | | | | 121 | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | – | | | | Yes | | – | | Yes | | | | – | | | | Yes | | – | | Yes | | | |
| | On-Board Flash Program | – | | | | Yes | | – | | Yes | | | | – | | | | Yes | | – | | Yes | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | Yes | | – | | | | Yes | | | | – | | Yes | | – | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A/FP-100U), PLQP0144KA-A (144P6Q-A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 32MHz/4.2 to 5.5V | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M32C/80 series

| Group | | M32C/88 (M32C/88T) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30880FHTGP★ | M30880FHUGP★ | M30880FWTGP★ | M30880FWUGP★ | M30880FJTGP★ | M30880FJUGP★ | M30882FWTGP★ | M30882FWUGP★ | M30882FHTGP★ | M30882FHUGP★ | M30882FJTGP★ | M30882FJUGP★ |
| Memory | ROM | 384K + 4K | | 320K + 4K | | 512K + 4K | | 320K + 4K | | 384K + 4K | | 512K + 4K | |
| | RAM | 18K | | | | | | | | | | | |
| | ROM Type (1) | F | | | | | | | | | | | |
| | Data Flash | Yes (4K) | | | | | | | | | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | | | | |
| CPU | CPU | M32C/80 core | | | | | | | | | | | |
| | Basic Instructions | 108 | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 31.3 (@32MHz) | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 48→48 | | | | | | | | | | | |
| | Barrel Shifter | Yes | | | | | | | | | | | |
| DMA | DMAC (Channels) | 4 | | | | | | | | | | | |
| | DTC/DMACII | DMACII (Startup Possible with All Peripheral Function Interrupt Causes) | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16) | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | 10-bit x 34 | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | |
| | Multi-Channel Sample and Hold | – | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | |
| | Input Capture | 8 (Intelligent I/O) | | | | | | | | | | | |
| | Output Compare | 8 (Intelligent I/O) | | | | | | | | | | | |
| | PWM Output | 13 (Timer A, Intelligent I/O) | | | | | | | | | | | |
| | Real-Time Port | – | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) + 2 (Intelligent I/O) | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 6 (UART, Intelligent I/O) | | | | | | | | | | | |
| $I^2C$-bus | | 5 (UART) | | | | | | | | | | | |
| IEBus | | 5 (UART) | | | | | | | | | | | |
| Smart Card/ SIM | | 5 (UART) | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 5 (UART) | | | | | | | | | | | |
| CAN | Channels | 3 | | | | | | | | | | | |
| | Message Box | 16 x 3 | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | |
| CRC Calculation Circuit | | Yes | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | | | | | 121 | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | |
| | Pull-Up Resistor | 85 | | | | | | 121 | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A / FP-100U), PLQP0144KA-A (144P6Q-A) | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 32MHz/4.2 to 5.5V | | | | | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | –40 to 105 | –40 to 85 | –40 to 105 | –40 to 85 | –40 to 105 | –40 to 85 | –40 to 105 | –40 to 85 | –40 to 105 | –40 to 85 | –40 to 105 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## M16C/60 series

| Group | | M16C/62P (M16C/62PT) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M3062CM6T-XXXGP | M3062CM8T-XXXGP | M3062CM8V-XXXGP | M3062CF8TGP | M3062CMAT-XXXGP | M3062CMAV-XXXGP | M3062AMCT-XXXGP | M3062AMCV-XXXGP | M3062AFCTGP | M3062AFCVGP | M3062JFHTFP | M3062JFHTGP | M3062JFHVGP |
| Memory | ROM | 48K | 64K | | 64K + 4K | 96K | | 128K | | 128K + 4K | | 384K + 4K | | |
| | RAM | 4K | | | | 5K | | 10K | | | | 31K | | |
| | ROM Type (1) | M | | | F | M | | | | F | | | | |
| | Data Flash | – | | | Yes (4K) | – | | | | Yes (4K) | | | | |
| | Program Security | – | | | Yes (ID Code Check Function, ROM Code Protect Function) | – | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | | | |
| CPU | CPU | M16C/60 core | | | | | | | | | | | | |
| | Basic Instructions | 91 | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 41.7 (@24MHz) | | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | – | | | | | | | | | | | | |
| | External Bus Interface | – | | | | | | | | | | | | |
| | Bus Structure | – | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | | |
| | Input Capture | – | | | | | | | | | | | | |
| | Output Compare | – | | | | | | | | | | | | |
| | PWM Output | 5 (Timer A) | | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (UART) | | | | | | | | | | | | |
| | Clock Sync. Only | 2 (SI/O) | | | | | | | | | | | | |
| | Clock Async. Only | – | | | | | | | | | | | | |
| $I^2C$-bus | | 3 (UART) | | | | | | | | | | | | |
| IEBus | | 3 (UART) | | | | | | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 3 (UART) | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | | |
| | Pull-Up Resistor | 85 | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | – | | | Yes | – | | | | Yes | | | | |
| | On-Board Flash Program | – | | | Yes | – | | | | Yes | | | | |
| Other Functions | ROM Correction Function | Yes | | | – | Yes | | | | – | | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A/FP-100U), PRQP0100JB-A (100P6S-A) | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 24MHz/4.0 to 5.5V | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | | –40 to 85 | –40 to 125 | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M16C/60 series

| Group | | M16C/62A (M16C/62T) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30623M4T-XXXGP | M30623M8T-XXXGP | M30623M8V-XXXGP | M30623MCT-XXXGP | M30623MCV-XXXGP | M30623ECTGP | M30623ECT-XXXGP | M30623ECVGP | M30623ECV-XXXGP | M30621FCTGP | M30621FCUGP | M30622M8T-XXXFP | M30622M8V-XXXFP | M30622MCT-XXXFP | M30622MCV-XXXFP | M30622ECTFP | M30622ECT-XXXFP | M30622ECVFP | M30622ECV-XXXFP | M30620FCTFP | M30620FCT-XXXFP | M30620FCUFP | M30624FGTGP | M30624FGT-XXXGP | M30624FGUFP | M30624FGU-XXXFP |
| Memory | ROM | 32K | 64K | | 128K | | | | | | | | 64K | | 128K | | | | | | | | | 256K | | | |
| | RAM | 3K | 4K | | 5K | | | | | | 10K | | 4K | | 5K | | | | | | 10K | | | 20K | | | |
| | ROM Type (1) | M | | | O | | | | | | F | | M | | O | | | | | | F | | | | | | |
| | Data Flash | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Program Security | – | | | | | | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | – | | | | | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | |
| CPU | CPU | M16C/60 core | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 91 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 62.5 (@16MHz) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | External Bus Interface | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Bus Structure | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 3 (Timer A) | | | | | | | | | | | 5 (Timer A) | | | | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 2 (Timer A) | | | | | | | | | | | 3 (Timer A) | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 (UART) | | | | | | | | | | | 3 (UART) | | | | | | | | | | | | | | |
| | Clock Sync. Only | 2(SI/O) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Clock Async. Only | 1 (UART) | | | | | | | | | | | – | | | | | | | | | | | | | | |
| $I^2C$-bus | | 1 (UART) | | | | | | | | | | | | | | | | | | | | | | | | | |
| IEBus | | 1 (UART) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 68 | | | | | | | | | | | 85 | | | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 68 | | | | | | | | | | | 85 | | | | | | | | | | | | | | |
| External Interrupt pins | | 8 | | | | | | | | | | | 11 | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | – | | | | | | | | | Yes | | – | | | | | | | | Yes | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | Yes | | – | | | | | | | | Yes | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | – | | Yes | | | | | | | | – | | | | | | |
| PKG Code | | PRQP0080JA-A (80P6S-A), PRQP0100JB-A (100P6S-A), PLQP0100KB-A (100P6Q-A/FP-100U) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 16MHz/4.2 to 5.5V, 16MHz/4.5 to 5.5V | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | | –40 to 125 | | –40 to 85 | –40 to 105 | –40 to 85 | | –40 to 125 | –40 to 85 | –40 to 125 | | –40 to 85 | | –40 to 125 | | –40 to 85 | | –40 to 105 | | –40 to 85 | –40 to 105 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M16C/60 series

| Group | | M16C/6N4 | | | | | | | | | | | | | | M16C/6N5 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M306N4FCTFP | M306N4FCTGP | M306N4FCVFP | M306N4FCVGP★ | M306N4FGTFP | M306N4FGTGP | M306N4FGVFP | M306N4FGVGP★ | M306N4MCT-XXXFP | M306N4MCT-XXXGP★ | M306N4MCV-XXXFP | M306N4MCV-XXXGP★ | M306N4MGT-XXXFP | M306N4MGT-XXXGP★ | M306N4MGV-XXXFP | M306N4MGV-XXXGP★ | M306N5FCTFP | M306N5FCTGP | M306N5FCVFP | M306N5FCVGP★ | M306N5MCT-XXXFP | M306N5MCT-XXXGP★ | M306N5MCV-XXXFP | M306N5MCV-XXXGP★ |
| Memory | ROM | 128K + 4K | | | | 256K + 4K | | | | 128K | | | | 256K | | | | 128K + 4K | | | | 128K | | | |
| | RAM | 5K | | | | 10K | | | | 5K | | | | 10K | | | | 5K | | | | | | | |
| | ROM Type (1) | F | | | | | | | | M | | | | | | | | F | | | | M | | | |
| | Data Flash | Yes (4K) | | | | | | | | – | | | | | | | | Yes (4K) | | | | – | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | – | | | | | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | | | – | | | |
| CPU | CPU | M16C/60 core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 91 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 1M | | | | | | | | | | | | | | | | | | | | | | | |
| | External Bus Interface | Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals | | | | | | | | | | | | | | | | | | | | | | | |
| | Bus Structure | Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20) | | | | | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | – | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 5 (Timer A) | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| | Clock Sync. Only | 1 (SI/O) | | | | | | | | | | | | | | | | | | | | | | | |
| | Clock Async. Only | – | | | | | | | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | 3 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| IEBus | | 3 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 3 (UART) | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 2 | | | | | | | | | | | | | | | | 1 | | | | | | | |
| | Message Box | 16 + 16 | | | | | | | | | | | | | | | | 16 | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | | | | | | | | | | | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 85 | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | – | | | | | | | | Yes | | | | – | | | |
| | On-Board Flash Program | Yes | | | | | | | | – | | | | | | | | Yes | | | | – | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | Yes | | | | | | | | – | | | | Yes | | | |
| PKG Code | | PRQP0100JB-A (100P6S-A), PLQP0100KB-A (100P6Q-A/FP-100U) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/4.2 to 5.5V | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | | | | | | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## M16C/60 series

| Group | | M16C/6NK | | | | M16C/6NM | | | |
|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M306NKFHTGP* | M306NKFHVGP** | M306NKFJTGP* | M306NKFJVGP* | M306NMFHTGP* | M306NMFHVGP** | M306NMFJTGP* | M306NMFJVGP* |
| Memory | ROM | 384K + 4K | | 512K + 4K | | 384K + 4K | | 512K + 4K | |
| | RAM | 31K | | | | | | | |
| | ROM Type (1) | F | | | | | | | |
| | Data Flash | Yes (4K) | | | | | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | |
| CPU | CPU | M16C/60 core | | | | | | | |
| | Basic Instructions | 91 | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | – | | | | | | | |
| | External Bus Interface | – | | | | | | | |
| | Bus Structure | – | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | |
| | PLL | Yes | | | | | | | |
| | Subclock | Yes | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 26 | | | | | | | |
| | Sample and Hold | Yes | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | |
| Timer | 16-bit Timer | 11 (Timer A, Timer B) | | | | | | | |
| | Input Capture | – | | | | | | | |
| | Output Compare | – | | | | | | | |
| | PWM Output | 5 (Timer A) | | | | | | | |
| | Event Counter | 11 (Timer A, Timer B) | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (UART) | | | | | | | |
| | Clock Sync. Only | 2 (SI/O) | | | | 4 (SI/O) | | | |
| | Clock Async. Only | – | | | | | | | |
| $I^2C$-bus | | 3 (UART) | | | | | | | |
| IEBus | | 3 (UART) | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | |
| SSU/ Special Serial I/O | | 3 (UART) | | | | | | | |
| CAN | Channels | 2 | | | | | | | |
| | Message Box | 16 + 16 | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) | | | | | | | |
| I/O Ports | Input Only (Numbers) | 1 | | | | | | | |
| | CMOS I/O (Numbers) | 85 | | | | 111 | | | |
| | N-Channel Open Drain Port (Numbers) | 2 | | | | | | | |
| | Pull-Up Resistor | 85 | | | | 111 | | | |
| External Interrupt pins | | 11 | | | | 14 | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | |
| PKG Code | | PLQP0100KB-A (100P6Q-A/FP-100U), PLQP0128KB-A (128P6Q-A) | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/4.2 to 5.5V | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## M16C/Tiny series

| Group | | M16C/26A (M16C/26T) | | | | | | M16C/28 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30260F3TGP | M30260F3VGP | M30260F6TGP | M30260F6VGP | M30260F8TGP | M30260F8VGP | M30280FATHP | M30280FAVHP | M30280M8T-XXXHP | M30280M8V-XXXHP★ | M30280MAT-XXXHP | M30280MAV-XXXHP★ | M30281FATHP | M30281FAVHP | M30281M8T-XXXHP | M30281M8V-XXXHP★ | M30281MAT-XXXHP | M30281MAV-XXXHP★ |
| Memory | ROM | 24K + 4K | | 48K + 4K | | 64K + 4K | | 96K + 4K | | 64K | | 96K | | 96K + 4K | | 64K | | 96K | |
| | RAM | 1K | | 2K | | | | 8K | | 4K | | 8K | | | | 4K | | 8K | |
| | ROM Type (1) | F | | | | | | | | M | | | | F | | M | | | |
| | Data Flash | Yes(4K) | | | | | | | | – | | | | Yes(4K) | | – | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | – | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | – | | | |
| CPU | CPU | M16C/60 core | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 91 | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | 10-bit x 27 | | | | | | 10-bit x 16 | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 8 (Timer A, Timer B) | | | | | | | | | | | | | | | | | |
| | Input Capture | – | | | | | | 8 (Timer S) | | | | | | | | | | | |
| | Output Compare | – | | | | | | 8 (Timer S) | | | | | | | | | | | |
| | PWM Output | 5 (Timer A) | | | | | | 13 (Timer A, Timer S) | | | | | | | | | | | |
| | Event Counter | 8 (Timer A, Timer B) | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) | | | | | | 3 (Timer A) + 1(Timer S) | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (UART) | | | | | | | | | | | | | | | | | |
| | Clock Sync. Only | – | | | | | | 2 (SI/O) | | | | | | 1(SI/O) | | | | | |
| | Clock Async. Only | – | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | 1 (UART) | | | | | | 2 (Multi master $I^2C$, UART) | | | | | | | | | | | |
| IEBus | | 1 (UART) | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 1 (UART) | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) / CRC-16 ($X^{16} + X^{15} + X^2 + 1$) | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | – | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 39 | | | | | | 71 | | | | | | 55 | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 39 | | | | | | 71 | | | | | | 55 | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | – | | | | Yes | | – | | | |
| | On-Board Flash Program | Yes | | | | | | | | – | | | | Yes | | – | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | Yes (Address match x 2) | | | | – | | Yes (Address match x 2) | | | |
| PKG Code | | PLQP0048KB-A (48P6Q-A) | | | | | | PLQP0080KB-A (80P6Q-A), PLQP0064KB-A (64P6Q-A) | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## M16C/Tiny series

| Group | | M16C/29 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | M30290FATHP | M30290FAVHP | M30290FCTHP | M30290FCVHP | M30290M8T-XXXHP | M30290M8V-XXXHP★ | M30290MAT-XXXHP | M30290MAV-XXXHP★ | M30290MCT-XXXHP | M30290MCV-XXXHP★ | M30291FATHP | M30291FAVHP | M30291FCTHP | M30291FCVHP | M30291M8T-XXXHP | M30291M8V-XXXHP★ | M30291MAT-XXXHP | M30291MAV-XXXHP★ | M30291MCT-XXXHP | M30291MCV-XXXHP★ |
| Memory | ROM | 96K + 4K | | 128K + 4K | | 64K | | 96K | | 128K | | 96K + 4K | | 128K + 4K | | 64K | | 96K | | 128K | |
| | RAM | 8K | | 12K | | 4K | | 8K | | 12K | | 8K | | 12K | | 4K | | 8K | | 12K | |
| | ROM Type (1) | F | | | | M | | | | | | F | | | | M | | | | | |
| | Data Flash | Yes (4K) | | | | – | | | | | | Yes (4K) | | | | – | | | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | – | | | | | | Yes (ID Code Check Function, ROM Code Protect Function) | | | | – | | | | | |
| CPU | CPU | M16C/60 core | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 91 | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | 2 | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 4 circuits (Main clock, PLL, Sub clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | |
| | PLL | Yes | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 27 | | | | | | | | | | 10-bit x 16 | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | | | | | | | | | |
| Timer | 16-bit Timer | 8 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 8 (Timer S) | | | | | | | | | | | | | | | | | | | |
| | Output Compare | 8 (Timer S) | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 13 (Timer A, Timer S) | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 8 (Timer A, Timer B) | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 3 (Timer A) + 1(Timer S) | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer) | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 (UART) | | | | | | | | | | | | | | | | | | | |
| | Clock Sync. Only | 2 (SI/O) | | | | | | | | | | 1 (SI/O) | | | | | | | | | |
| | Clock Async. Only | – | | | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | 2 (Multi master $I^2C$, UART) | | | | | | | | | | | | | | | | | | | |
| IEBus | | 1 (UART) | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 1 (UART) | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 1 (UART) | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | 1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$) ) / CRC-16 ($X^{16} + X^{15} + X^2 + 1$) | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | – | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 71 | | | | | | | | | | 55 | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 71 | | | | | | | | | | 55 | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | – | | | | | | Yes | | | | – | | | | | |
| | On-Board Flash Program | Yes | | | | – | | | | | | Yes | | | | – | | | | | |
| Other Functions | ROM Correction Function | – | | | | Yes (Address match x 2) | | | | | | – | | | | Yes (Address match x 2) | | | | | |
| PKG Code | | PLQP0080KB-A (80P6Q-A), PLQP0064KB-A (64P6Q-A) | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V | 20MHz/ 3.0 to 5.5V | 16MHz/ 4.2 to 5.5V |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## M16C/10 series

| Group | | M16C/1N | | | | | |
|---|---|---|---|---|---|---|---|
| Part No. | | M301N2F8TFP | M301N2F8VFP | M301N2M4T-XXXFP | M301N2M4V-XXXFP | M301N2M8T-XXXFP | M301N2M8V-XXXFP |
| Memory | ROM | 64K + 4K | | 32K | | 64K | |
| | RAM | 3K | | 1K | | 3K | |
| | ROM Type (1) | F | | M | | | |
| | Data Flash | Yes (4K) | | – | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | – | | | |
| CPU | CPU | M16C/60 core | | | | | |
| | Basic Instructions | 91 | | | | | |
| | Minimum Instruction Execution Time (ns) | 62.5 (@16MHz) | | | | | |
| | Multiplier | 16 x 16→32 | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | |
| DMA | DMAC (Channels) | – | | | | | |
| Clock | Clock Generation Circuit | 3 circuits (Main clock, Sub clock, On-chip oscillator) | | | | | |
| | PLL | – | | | | | |
| | Subclock | Yes | | | | | |
| | On-Chip Oscillator | Yes | | | | | |
| | Oscillation Stop Detection | Yes | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | |
| | Power Save | Wait / Stop | | | | | |
| Voltage Detection | LVD (Low Voltage Detection) | – | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 14 | | | | | |
| | Sample and Hold | Yes | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 1 | | | | | |
| Timer | 8-bit Timer | 4 (Timer 1, Timer X, Timer Y, Timer Z) | | | | | |
| | 16-bit Timer | 1 (Timer C) | | | | | |
| | Input Capture | 1 (Timer C) | | | | | |
| | Output Compare | – | | | | | |
| | PWM Output | 2 (Timer Y, Timer Z) | | | | | |
| | Event Counter | 1 (Timer X) | | | | | |
| | 2-Phase Encoder Input | – | | | | | |
| | 3-Phase Inverter Control | – | | | | | |
| Watchdog Timer | | – | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 (UART) | | | | | |
| | Clock Sync. Only | – | | | | | |
| | Clock Async. Only | – | | | | | |
| $I^2C$-bus | | – | | | | | |
| IEBus | | – | | | | | |
| Smart Card/ SIM | | – | | | | | |
| SSU/ Special Serial I/O | | – | | | | | |
| CAN | Channels | 1 | | | | | |
| | Message Box | 16 | | | | | |
| CRC Calculation Circuit | | – | | | | | |
| I/O Ports | Input Only (Numbers) | – | | | | | |
| | CMOS I/O (Numbers) | 37 | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | |
| | Pull-Up Resistor | 37 | | | | | |
| External Interrupt pins | | 8 | | | | | |
| Debug Function | On-Chip Debug | Yes | | – | | | |
| | On-Board Flash Program | Yes | | – | | | |
| Other Functions | ROM Correction Function | – | | Yes | | | |
| | Other | – | | | | | |
| PKG Code | | PLQP0048KB-A (48P6Q-A) | | | | | |
| Operating Frequency/ Supply Voltage | | 16MHz / 4.2 to 5.5V | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## R8C/Tiny series

| Group | | R8C/20 | | | | | | | | | | R8C/21 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | R5F21206JFP* | R5F21206KFP** | R5F21207JFP* | R5F21207KFP** | R5F21208JFP** | R5F21208KFP** | R5F2120AJFP** | R5F2120AKFP** | R5F2120CJFP** | R5F2120CKFP** | R5F21216JFP* | R5F21216KFP** | R5F21217JFP* | R5F21217KFP** | R5F21218JFP** | R5F21218KFP** | R5F2121AJFP** | R5F2121AKFP** | R5F2121CJFP** | R5F2121CKFP** |
| Memory | ROM | 32K | | 48K | | 64K | | 96K | | 128K | | 32K + 2K | | 48K + 2K | | 64K + 2K | | 96K + 2K | | 128K + 2K | |
| | RAM | 2K | | 2.5K | | 3K | | 5K | | 6K | | 2K | | 2.5K | | 3K | | 5K | | 6K | |
| | ROM Type (1) | F | | | | | | | | | | | | | | | | | | | |
| | Data Flash | – | | | | | | | | | | Yes (2K) | | | | | | | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | R8C core | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 89 | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes (High precision, High speed : 40MHz, Low speed : 125kHz) | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset / POR | Yes | | | | | | | | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes (Voltage detection 2) | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (Timer RA, Timer RB, Timer RE) | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 8 (shared with Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Output Compare | 9 (shared with Timer RD, Timer RE) | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 7 (shared with Timer RB, Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 1 (shared with Timer RA) | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | – | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer RD) | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (with automatic start, clock source protection function) | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 (UART0) | | | | | | | | | | | | | | | | | | | |
| | Clock Async. Only | 1 (UART1) | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 (Share with SSU) | | | | | | | | | | | | | | | | | | | |
| IEBus | | – | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | – | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 1 (Share with IIC) | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 3 | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 41 | | | | | | | | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 41 | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 8 | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | | | | | | | | | | | | |
| | Other | – | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0048KB-A (48P6Q-A) | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## R8C/Tiny series

| Group | | R8C/22 | | | | | | | | | | R8C/23 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | R5F21226JFP* | R5F21226KFP** | R5F21227JFP* | R5F21227KFP** | R5F21228JFP** | R5F21228KFP** | R5F2122AJFP** | R5F2122AKFP** | R5F2122CJFP** | R5F2122CKFP** | R5F21236JFP* | R5F21236KFP** | R5F21237JFP* | R5F21237KFP** | R5F21238JFP** | R5F21238KFP** | R5F2123AJFP** | R5F2123AKFP** | R5F2123CJFP** | R5F2123CKFP** |
| Memory | ROM | 32K | | 48K | | 64K | | 96K | | 128K | | 32K + 2K | | 48K + 2K | | 64K + 2K | | 96K + 2K | | 128K + 2K | |
| | RAM | 2K | | 2.5K | | 3K | | 5K | | 6K | | 2K | | 2.5K | | 3K | | 5K | | 6K | |
| | ROM Type (1) | F | | | | | | | | | | | | | | | | | | | |
| | Data Flash | – | | | | | | | | | | Yes (2K) | | | | | | | | | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | R8C core | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 89 | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, On-chip oscillator) | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | Yes (High precision, High speed : 40MHz, Low speed : 125kHz) | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset / POR | Yes | | | | | | | | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes (Voltage detection 2) | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (Timer RA, Timer RB, Timer RE) | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Input Capture | 8 (shared with Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Output Compare | 9 (shared with Timer RD, Timer RE) | | | | | | | | | | | | | | | | | | | |
| | PWM Output | 7 (shared with Timer RB, Timer RD) | | | | | | | | | | | | | | | | | | | |
| | Event Counter | 1 (shared with Timer RA) | | | | | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | – | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | 1 (shared with Timer RD) | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (with automatic start, clock source protection function) | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 (UART0) | | | | | | | | | | | | | | | | | | | |
| | Clock Async. Only | 1 (UART1) | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 (Share with SSU) | | | | | | | | | | | | | | | | | | | |
| IEBus | | – | | | | | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | – | | | | | | | | | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 1 (Share with IIC) | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 3 | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 41 | | | | | | | | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 41 | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 8 | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | | | | | | | | | | | | |
| | Other | – | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0048KB-A (48P6Q-A) | | | | | | | | | | | | | | | | | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 20MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V | 16MHz/ 3.0 to 5.5V, 10MHz/ 2.7 to 5.5V |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## R8C/Tiny series

| Group | | R8C/26 | | | | R8C/27 | | | | R8C/28 | | R8C/29 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | | R5F21264JFP** | R5F21264KFP** | R5F21266JFP** | R5F21266KFP** | R5F21274JFP** | R5F21274KFP** | R5F21276JFP** | R5F21276KFP** | R5F21284JSP** | R5F21284KSP** | R5F21294JSP** | R5F21294KSP** |
| Memory | ROM | 16K | | 32K | | 16K + 2K | | 32K + 2K | | 16K | | 16K + 2K | |
| | RAM | 1K | | 1.5K | | 1K | | 1.5K | | 1K | | | |
| | ROM Type (1) | F | | | | | | | | | | | |
| | Data Flash | – | | | | Yes (2K) | | | | – | | Yes (2K) | |
| | Program Security | Yes (ID Code Check Function, ROM Code Protect Function) | | | | | | | | | | | |
| CPU | CPU | R8C core | | | | | | | | | | | |
| | Basic Instructions | 89 | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) | 50 (@20MHz) | 62.5 (@16MHz) |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, On-chip oscillator) | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | |
| | On-Chip Oscillator | Yes (High precision, High speed : 40MHz, Low speed : 125kHz) | | | | | | | | | | | |
| | Oscillation Stop Detection | Yes | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16) | | | | | | | | | | | |
| | Power Save | Wait / Stop | | | | | | | | | | | |
| Voltage Detection | Power-On Reset / POR | Yes | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes (Voltage detection 2) | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | | | 10-bit x 4 | | | |
| | Sample and Hold | Yes | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (Timer RA, Timer RB, Timer RE) | | | | | | | | | | | |
| | 16-bit Timer | 1 (Timer RD) | | | | | | | | | | | |
| | Input Capture | 4 (shared with Timer RC) | | | | | | | | | | | |
| | Output Compare | 5 (shared with Timer RC, Timer RE) | | | | | | | | | | | |
| | PWM Output | 4 (shared with Timer RB, Timer RC) | | | | | | | | | | | |
| | Event Counter | 1 (shared with Timer RA) | | | | | | | | | | | |
| | 2-Phase Encoder Input | – | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | |
| Watchdog Timer | | 1 (with automatic start, clock source protection function) | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 (UART0, UART1) | | | | | | | | 1 (UART0) | | | |
| | Clock Async. Only | – | | | | | | | | 1 (UART1) | | | |
| $I^2C$-bus | | 1 (Share with SSU) | | | | | | | | | | | |
| IEBus | | – | | | | | | | | | | | |
| Smart Card/ SIM | | – | | | | | | | | | | | |
| SSU/ Special Serial I/O | | 1 (Share with IIC) | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 3 | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 25 | | | | | | | | 13 | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | | | | | | |
| | Pull-Up Resistor | 25 | | | | | | | | 13 | | | |
| External Interrupt pins | | 7 | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | |
| | On-Board Flash Program | Yes | | | | | | | | | | | |
| Other Functions | ROM Correction Function | – | | | | | | | | | | | |
| | Other | – | | | | | | | | | | | |
| PKG Code | | PLQP0032GB-A (32P6U-A) | | | | | | | | PLSP0020JB-A (20P2F-A) | | | |
| Operating Frequency/ Supply Voltage | | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V | 16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V |
| Operating Ambient Temperature (°C) | | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 | –40 to 85 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8SX/1500 series

| Series | | H8SX/1520R | H8SX/1544 | |
|---|---|---|---|---|
| Group | | H8SX/1527RF | H8SX/1543F | H8SX/1544F |
| Part No. | | R5F61527RFP** | R5F61543FP** | R5F61544FP** |
| Memory | ROM | 256K | 384K | 512K |
| | RAM | 12K | 16K | 24K |
| | ROM Type (1) | F | | |
| | Cache Memory | – | | |
| | Program Security | Yes (Hardware Protect, Software Protect, Error Protect) | | |
| CPU | CPU | H8SX core | | |
| | Basic Instructions | 87 | | |
| | Minimum Instruction Execution Time (ns) | 21 (@48MHz) | 25 (@40MHz) | |
| | Multiplier | 16 x 16→32 | 32 x 32→32 | |
| | Multiply -Accumulate Instruction | 16 x 16 + 32→32 | | |
| DMA | DMAC (Channels) | 4 | | |
| | DTC/DMACII | – | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | |
| | Bus State Controller | – | ROM / Burst ROM / SRAM / Bytes control SRAM | |
| | Bus Structure | – | | |
| | Endian Conversion | – | | |
| Clock | Clock Generation Circuit | 1 circuit (Main clock) | | |
| | PLL | Yes | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8) | | |
| | Power Save | Sleep / Full module clock stop / Software standby / Hardware standby | Sleep / Full module clock stop / Software standby / Hardware standby | |
| A/D Converter | Resolution x Channels | 10-bit x 16 | | |
| | Sample and Hold | Yes | | |
| | Multi-Channel Sample and Hold | – | | |
| D/A Converter | Resolution x Channels | – | 8-bit x 2 | |
| Timer | 8-bit Timer | – | | |
| | 16-bit Timer | 12 (TPU) | 6 (TPU) | |
| | 32-bit Timer | 2 (TPU) | | |
| | Input Capture | 10 (shared with TPU) | 6 (shared with TPU) | |
| | Output Compare | 10 (shared with TPU) | 6 (shared with TPU) | |
| | PWM Output | 10 (shared with TPU) | 6 (shared with TPU) | |
| | Programmable Pulse Generator | 8 (shared with TPU + PPG) | – | |
| | Event Counter | 4 (shared with TPU) | | |
| | 2-Phase Encoder Input | 2 (shared with TPU) | | |
| Watchdog Timer | | 1 | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | 3 | |
| | Clock Sync. Only | – | | |
| | Clock Async. Only | – | | |
| $I^2C$-bus | | – | 2 | |
| Smart Card/ SIM | | 2 | 3 | |
| SSU / Special Serial I/O | | 3 | 2 | |
| CAN | Channels | 1 | 2 | |
| | Message Box | 16 | | |
| USB Function | | – | | |
| IrDA | | – | | |
| I/O Ports | Input Only (Numbers) | 17 | | |
| | CMOS I/O (Numbers) | 65 | 95 | |
| | N-Channel Open Drain Port (Numbers) | 15 | 24 | |
| | Pull-Up Resistor | 32 | 56 | |
| External Interrupt pins | | 16 (NMI + 15 (8 level) ) | 17 (NMI + 16 (8 level) ) | |
| Debug Function | On-Chip Debug | Yes | | |
| | On-Board Flash Program | Yes | | |
| PKG Code | | PRQP0100KB-A (FP-100M) | PLQP0144KA-A (FP-144L) | |
| Operating Frequency / Supply Voltage | | 48MHz/4.5 to 5.5V | 40MHz/4.5 to 5.5V | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | –40 to 105 | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8S/2600 series

| Series | | H8S/2612 | | | | | H8S/2615 | | H8S/2628 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8S/2611 | H8S/2612 | H8S/2612F | H8S/2614 | H8S/2616 | H8S/2615 | H8S/2615F | H8S/2627 | H8S/2628 | H8S/2628F |
| Part No. | | HD6432611XXXFA | HD6432612XXXFA | HD64F2612FA | HD6432614XXXFA | HD6432616XXXFA | HD6432615XXXFA | HD64F2615FA | HD6432627XXXF | HD6432628XXXF | HD64F2628F |
| Memory | ROM | 64K | 128K | | 64K | 128K | 64K | | 96K | 128K | |
| | RAM | 4K | | | | | | | 6K | 8K | |
| | ROM Type (1) | M | | F | M | | | F | M | | F |
| | Program Security | – | | Yes (H/W Protect, S/W Protect, Error Protect) | – | | | Yes (H/W Protect, S/W Protect, Error Protect) | – | | Yes (H/W Protect, S/W Protect, Error Protect) |
| CPU | CPU | H8S/2600 core | | | | | | | | | |
| | Basic Instructions | 69 | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | 41.7 (@24MHz) | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 42→42 | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | |
| | EXDMAC (Channels) | – | | | | | | | | | |
| | DTC/DMACII | DTC | | | – | | | | DTC | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | | | | | | | | |
| | Bus State Controller | – | | | | | | | | | |
| | Bus Structure | – | | | | | | | | | |
| | SDRAM Controller | – | | | | | | | | | |
| | DRAM Controller | – | | | | | | | | | |
| | Host Interface | – | | | | | | | | | |
| Clock | Clock Generation Circuit | 1 circuits (Main clock) | | | 2 circuits (Main clock, Sub clock) | | | | 1 circuits (Main clock) | | |
| | PLL | Yes ( x 1, x 2, x 4) | | | | | | | | | |
| | Subclock | – | | | Yes (128 division) | | | | – | | |
| | RTC | – | | | Yes (WDT for watch) | | | | – | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16, 32) | | | 1/n (n=1, 2, 4, 8, 16, 32, 128) | | | | 1/n (n=1, 2, 4, 8, 16, 32) | | |
| | Power Save | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | | | Normal operating / Medium-speed / Sleep / Module stop/Watch / Sub active / Sub sleep/ Software standby / Hardware standby | | | | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | 10-bit x 16 | | | | |
| | Sample and Hold | Yes | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | | | |
| Timer | 8-bit Timer | – | | | | | | | 4 (TMR) | | |
| | 16-bit Timer | 6 (TPU) | | | | | | | | | |
| | 32-bit Timer | – | | | | | | | | | |
| | Input Capture | 6 (shared with TPU) | | | | | | | | | |
| | Output Compare | 6 (shared with TPU) | | | | | | | | | |
| | PWM Output | 7 (1 (MMT) + 6 (TPU) ) | | | 6 (shared with TPU) | | | | | | |
| | Real-Time Port | – | | | | | | | | | |
| | Programmable Pulse Generator | 8 (shared with TPU + PPG) | | | – | | | | 8 (shared with TPU + PPG) | | |
| | Event Counter | 2 (shared with TMR), 4 (shared with TPU) | | | | | | | | | |
| | 2-Phase Encoder Input | 2 (shared with TPU) | | | | | | | | | |
| Watchdog Timer | | 1 | | | 2 | | | | 1 | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 | | | | | | | 2 | | |
| I²C-bus | | – | | | | | | | | | |
| IEBus | | – | | | | | | | | | |
| Smart Card/ SIM | | 3 | | | | | | | 2 | | |
| SSU / Special Serial I/O | | – | | | | | | | 2 | | |
| CAN | Channels | 1 | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | |
| USB Function | | – | | | | | | | | | |
| LPC/ ISA | | – | | | | | | | | | |
| IrDA | | – | | | | | | | | | |
| LCD | | – | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 22 | | | – | | 18 | | 26 | | |
| | CMOS Output Only (Numbers) | 1 | | | – | | | | 1 | | |
| | CMOS I/O (Numbers) | 43 | | | – | | 39 | | 59 | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 20 | | | | | | | | | |
| | DTMF | – | | | | | | | | | |
| | High Current Drive Port | – | | | | | | | | | |
| | Pull-Up Resistor | 28 | | | – | | 24 | | 28 | | |
| | NMOS Push-Pull | – | | | | | | | | | |
| External Interrupt pins | | 7 (NMI+6 (8 level) ) | | | | | | | | | |
| Debug Function | Boundary Scan/JTAG | – | | | | | | | | | |
| | On-Chip Debug | – | | | | | | | | | |
| | On-Board Flash Program | – | Yes | | – | | Yes | | – | Yes | |
| Other Functions | ROM Correction Function | Yes (PC break) | | | – | | | | Yes (PC break) | | |
| | Other | MMT ( x 1) | | | – | | | | | | |
| PKG Code | | PRQP0080JD-A (FP-80Q) | | | | | | | PRQP0100KB-A (FP-100M) | | |
| Operating Frequency / Supply Voltage | | 20MHz / 4.5 to 5.5V | | | 24MHz / 4.5 to 5.5V | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85, –40 to 105, –40 to 125 | | | | | | | –40 to 85 | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8S/2600 series

| Series | | H8S/2630 | | | | | | H8S/2636 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8S/2630 | H8S/2630F | H8S/2630U | H8S/2630UF | H8S/2630W | H8S/2630WF | H8S/2636 | H8S/2636F | H8S/2636U | H8S/2636UF |
| Part No. | | HD6432630XXXF | HD64F2630F | HD6432630UXXXF | HD64F2630UF | HD6432630WXXXF | HD64F2630WF | HD6432636XXXF | HD64F2636F | HD6432636UXXXF | HD64F2636UF |
| Memory | ROM | 384K | | | | | | 128K | | | |
| | RAM | 16K | | | | | | 4K | | | |
| | ROM Type (1) | M | F | M | F | M | F | M | F | M | F |
| | Program Security | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) |
| CPU | CPU | H8S/2600 core | | | | | | | | | |
| | Basic Instructions | 69 | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 42→42 | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | |
| | EXDMAC (Channels) | – | | | | | | | | | |
| | DTC/DMACII | DTC | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | | | | | | | | |
| | Bus State Controller | Direct connection to ROM/SRAM is supported | | | | | | | | | |
| | Bus Structure | Separate bus (8/16-bit) | | | | | | | | | |
| | SDRAM Controller | – | | | | | | | | | |
| | DRAM Controller | – | | | | | | | | | |
| | Host Interface | – | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, Sub clock) | | | | | | | | | |
| | PLL | Yes ( x 1, x 2, x 4) | | | | | | | | | |
| | Subclock | – | | Yes | | | | – | | Yes | |
| | RTC | – | | Yes (WDT for watch) | | | | – | | Yes (WDT for watch) | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16, 32) | | | | | | | | | |
| | Power Save | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | | Normal operating / Medium-speed/ Sleep / Module stop/Watch / Sub active / Sub sleep / Software standby / Hardware standby | | | | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | | Normal operating / Medium-speed / Sleep / Module stop/Watch / Sub active / Sub sleep/ Software standby / Hardware standby | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | |
| D/A Converter | Resolution x Channels | 8-bit x 2 | | | | | | | | | |
| Timer | 8-bit Timer | – | | | | | | | | | |
| | 16-bit Timer | 6 (TPU) | | | | | | | | | |
| | 32-bit Timer | – | | | | | | | | | |
| | Input Capture | 6 (shared with TPU) | | | | | | | | | |
| | Output Compare | 6 (shared with TPU) | | | | | | | | | |
| | PWM Output | 8 (2 (PWM) + 6 (TPU) ) | | | | | | | | | |
| | Real-Time Port | – | | | | | | | | | |
| | Programmable Pulse Generator | 8 (shared with TPU + PPG ) | | | | | | | | | |
| | Event Counter | 4 (shared with TPU) | | | | | | | | | |
| | 2-Phase Encoder Input | 2 (shared with TPU) | | | | | | | | | |
| Watchdog Timer | | 2 | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 | | | | | | | | | |
| $I^2C$-bus | | – | | | | 2 | | – | | | |
| IEBus | | – | | | | | | | | | |
| Smart Card/ SIM | | 3 | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | |
| CAN | Channels | 2 | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | |
| USB Function | | – | | | | | | | | | |
| LPC/ ISA | | – | | | | | | | | | |
| IrDA | | – | | | | | | | | | |
| LCD | | – | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 23 | | | | | | | | | |
| | CMOS Output Only (Numbers) | 2 | | | | | | | | | |
| | CMOS I/O (Numbers) | 72 | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 26 | | | | 24 | | 26 | | | |
| | DTMF | – | | | | | | | | | |
| | High Current Drive Port | – | | | | | | | | | |
| | Pull-Up Resistor | 36 | | | | | | | | | |
| | NMOS Push-Pull | – | | | | 2 | | – | | | |
| External Interrupt pins | | 7 (NMI + 6 (8 level) ) | | | | | | | | | |
| Debug Function | Boundary Scan/JTAG | – | | | | | | | | | |
| | On-Chip Debug | – | | | | | | | | | |
| | On-Board Flash Program | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes |
| Other Functions | ROM Correction Function | Yes (PC break) | | | | | | | | | |
| | Other | 10-bit PWM Timer ( x 2) | | | | | | | | | |
| PKG Code | | PRQP0128KB-A (FP-128B) | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz / 4.5 to 5.5V | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85, –40 to 105 | | | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8S/2600 series

| Series | | H8S/2635 | | | | | | H8S/2638 | | | | | | H8S/2639 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8S/2634 | H8S/2634U | H8S/2635 | H8S/2635F | H8S/2635U | H8S/2635UF | H8S/2638 | H8S/2638F | H8S/2638U | H8S/2638UF | H8S/2638W | H8S/2638WF | H8S/2639U | H8S/2639UF | H8S/2639W | H8S/2639WF |
| Part No. | | HD6432634XXXF | HD6432634UXXXF | HD6432635XXXF | HD64F2635F | HD6432635UXXXF | HD64F2635UF | HD6432638XXXF | HD64F2638F | HD6432638UXXXF | HD64F2638UF | HD6432638WXXXF | HD64F2638WF | HD6432639UXXXF | HD64F2639UF | HD6432639WXXXF | HD64F2639WF |
| Memory | ROM | 128K | | 192K | | | | 256K | | | | | | | | | |
| | RAM | 6K | | | | | | 16K | | | | | | | | | |
| | ROM Type (1) | M | | F | | M | F | M | F | M | F | M | F | M | F | M | F |
| | Program Security | – | | Yes (H/W Protect, S/W Protect, Error Protect) | | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) | – | Yes (H/W Protect, S/W Protect, Error Protect) |
| CPU | CPU | H8S/2600 core | | | | | | | | | | | | | | | |
| | Basic Instructions | 69 | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | | | | | | | | | | 200 (@5MHz) | | | |
| | Multiplier | 16 x 16→32 | | | | | | | | | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 42→42 | | | | | | | | | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | | | | | | | | | |
| | EXDMAC (Channels) | – | | | | | | | | | | | | | | | |
| | DTC/DMACII | – | | | | | | DTC | | | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | | | | | | | | | | | | | | |
| | Bus State Controller | Direct connection to ROM/SRAM is supported | | | | | | | | | | | | | | | |
| | Bus Structure | Separate bus (8/16-bit) | | | | | | | | | | | | | | | |
| | SDRAM Controller | – | | | | | | | | | | | | | | | |
| | DRAM Controller | – | | | | | | | | | | | | | | | |
| | Host Interface | – | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 1 circuits (Main clock) | 2 circuits (Main clock, Sub clock) | 1 circuits (Main clock) | 2 circuits (Main clock, Sub clock) | | | | | | | | | | | | |
| | PLL | Yes ( x 1, x 2, x 4) | | | | | | | | | | | | | | | |
| | Subclock | Yes (128 division) | | | | | | – | Yes | | | | | Yes (128 division) | | | |
| | RTC | Yes (WDT for watch) | | | | | | – | Yes (WDT for watch) | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16, 32) | 1/n (n=1, 2, 4, 8, 16, 32, 128) | 1/n (n=1, 2, 4, 8, 16, 32) | 1/n (n=1, 2, 4, 8, 16, 32, 128) | | | 1/n (n=1, 2, 4, 8, 16, 32) | | | | | | 1/n (n=1, 2, 4, 8, 16, 32, 128) | | | |
| | Power Save | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | Normal operating / Medium-speed / Sleep / Module stop / Watch / Sub active / Sub sleep / Software standby / Hardware standby | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | Normal operating / Medium-speed / Sleep / Module stop / Watch / Sub active / Sub sleep / Software standby / Hardware standby | | | Normal operating / Medium-speed / Sleep / Module stop / Software standby / Hardware standby | Normal operating / Medium-speed / Sleep / Module stop / Watch / Sub active / Sub sleep / Software standby / Hardware standby | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | 8-bit x 2 | | | | | | | | | |
| Timer | 8-bit Timer | – | | | | | | | | | | | | | | | |
| | 16-bit Timer | 6 (TPU) | | | | | | | | | | | | | | | |
| | 32-bit Timer | – | | | | | | | | | | | | | | | |
| | Input Capture | 6 (shared with TPU) | | | | | | | | | | | | | | | |
| | Output Compare | 6 (shared with TPU) | | | | | | | | | | | | | | | |
| | PWM Output | 8 (2 (PWM) + 6 (TPU) ) | | | | | | | | | | | | | | | |
| | Real-Time Port | – | | | | | | | | | | | | | | | |
| | Programmable Pulse Generator | – | | | | | | 8 (shared with TPU + PPG) | | | | | | | | | |
| | Event Counter | 4 (shared with TPU) | | | | | | | | | | | | | | | |
| | 2-Phase Encoder Input | 2 (shared with TPU) | | | | | | | | | | | | | | | |
| Watchdog Timer | | 2 | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | 2 | | – | | 2 | |
| IEBus | | – | | | | | | | | | | | | | | | |
| Smart Card/ SIM | | 3 | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | 2 | | | | | | | | | |
| | Message Box | 16 | | | | | | | | | | | | | | | |
| USB Function | | – | | | | | | | | | | | | | | | |
| LPC/ ISA | | – | | | | | | | | | | | | | | | |
| IrDA | | – | | | | | | | | | | | | | | | |
| LCD | | – | | | | | | | | | | | | | | | |
| CRC Calculation Circuit | | – | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | – | | | | | | 23 | | | | | | | | | |
| | CMOS Output Only (Numbers) | – | | | | | | 2 | | | | | | | | | |
| | CMOS I/O (Numbers) | – | | | | | | 72 | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | – | | | | | | 26 | | | | 24 | | 26 | | 24 | |
| | DTMF | – | | | | | | | | | | | | | | | |
| | High Current Drive Port | – | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | – | | | | | | 36 | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | 2 | | – | | 2 | |
| External Interrupt pins | | 7 (NMI + 6 (8 level) ) | | | | | | | | | | | | | | | |
| Debug Function | Boundary Scan/JTAG | – | | | | | | | | | | | | | | | |
| | On-Chip Debug | – | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | Yes | | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes |
| Other Functions | ROM Correction Function | – | | | | | | Yes (PC break) | | | | | | | | | |
| | Other | 10-bit PWM Timer ( x 2) | | | | | | | | | | | | | | | |
| PKG Code | | PRQP0128KB-A (FP-128B) | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz /4 .5 to 5.5V | | | | | | | | | | | | 5MHz (PLL: 20MHz) /4.5 to 5.5V | | | |
| Operating Ambient Temperature (°C) | | –40 to 85, –40 to 105 | | | | | | | | | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8S/2600 series

| Series | | H8S/2646 | | | H8S/2648 | | | H8S/2649 | |
|---|---|---|---|---|---|---|---|---|---|
| Group | | H8S/2645 | H8S/2646 | H8S/2646RF | H8S/2647 | H8S/2648 | H8S/2648RF | H8S/2649 | H8S/2649F |
| Part No. | | HD6432645XXXFC | HD6432646XXXFC | HD64F2646RFC | HD6432647XXXFC | HD6432648XXXFC | HD64F2648RFC | HD6432649XXXFC | HD64F2649FC |
| Memory | ROM | 64K | 128K | | 64K | 128K | | 256K | |
| | RAM | 2K | 4K | | 2K | 4K | | 8K | |
| | ROM Type (1) | M | F | | M | F | | M | F |
| | Program Security | – | Yes (H/W Protect, S/W Protect, Error Protect) | | – | Yes (H/W Protect, S/W Protect, Error Protect) | | – | Yes (H/W Protect, S/W Protect, Error Protect) |
| CPU | CPU | H8S/2600 core | | | | | | | |
| | Basic Instructions | 69 | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | | | | | | |
| | Multiplier | 16 x 16→32 | | | | | | | |
| | Multiply -Accumulate Instruction | 16 x 16 + 42→42 | | | | | | | |
| DMA | DMAC (Channels) | – | | | | | | | |
| | EXDMAC (Channels) | – | | | | | | | |
| | DTC/DMACII | DTC | | | | | | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | | | | | | |
| | Bus State Controller | Direct connection to ROM/SRAM is supported | | | | | | | |
| | Bus Structure | Separate bus (8/16-bit) | | | | | | | |
| | SDRAM Controller | – | | | | | | | |
| | DRAM Controller | – | | | | | | | |
| | Host Interface | – | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, Sub clock) | | | | | | | |
| | PLL | Yes ( x 1, x 2, x 4) | | | | | | | |
| | Subclock | Yes | | | | | | | |
| | RTC | Yes (WDT for watch) | | | | | | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16, 32) | | | | | | | |
| | Power Save | Normal operating / Medium-speed / Sleep / Module stop/Watch / Sub active / Sub sleep / Software standby / Hardware standby | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 12 | | | | | | 10-bit x 16 | |
| | Sample and Hold | Yes | | | | | | | |
| D/A Converter | Resolution x Channels | – | | | | | | | |
| Timer | 8-bit Timer | – | | | | | | | |
| | 16-bit Timer | 6 (TPU) | | | | | | | |
| | 32-bit Timer | – | | | | | | | |
| | Input Capture | 6 (shared with TPU) | | | | | | | |
| | Output Compare | 6 (shared with TPU) | | | | | | | |
| | PWM Output | 8 (2 (PWM) + 6 (TPU) ) | | | | | | | |
| | Real-Time Port | – | | | | | | | |
| | Programmable Pulse Generator | 8 (shared with TPU + PPG) | | | | | | | |
| | Event Counter | 4 (shared with TPU) | | | | | | | |
| | 2-Phase Encoder Input | 2 (shared with TPU) | | | | | | | |
| Watchdog Timer | | 2 | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | 3 | | | 4 | |
| I²C-bus | | – | | | | | | | |
| IEBus | | – | | | | | | | |
| Smart Card/ SIM | | 2 | | | 3 | | | 4 | |
| SSU / Special Serial I/O | | – | | | | | | | |
| CAN | Channels | 1 | | | 2 | | | | |
| | Message Box | 16 | | | | | | | |
| USB Function | | – | | | | | | | |
| LPC/ ISA | | – | | | | | | | |
| IrDA | | – | | | | | | | |
| LCD | | 24seg x 4com | | | 40seg x 4com | | | | |
| CRC Calculation Circuit | | – | | | | | | | |
| I/O Ports | Input Only (Numbers) | 28 | | | | | | | |
| | CMOS Output Only (Numbers) | 1 | | | | | | | |
| | CMOS I/O (Numbers) | 92 | | | | | | 97 | |
| | High Voltage Port (Numbers) | 48 | | | | | | | |
| | N-Channel Open Drain Port (Numbers) | 32 | | | | | | | |
| | DTMF | – | | | | | | | |
| | High Current Drive Port | 32 (Port for LED drive) | | | | | | | |
| | Pull-Up Resistor | 40 | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | |
| External Interrupt pins | | 7 (NMI+6 (8 level) ) | | | | | | | |
| Debug Function | Boundary Scan/JTAG | – | | | | | | | |
| | On-Chip Debug | – | | | | | | | |
| | On-Board Flash Program | – | Yes | | – | Yes | | – | Yes |
| Other Functions | ROM Correction Function | Yes (PC break) | | | | | | | |
| | Other | 10-bit PWM Timer ( x 2) | | | | | | | |
| PKG Code | | PRQP0144KA-A (FP-144G) | PRQP0144KB-A (FP-144J) | | PRQP0144KA-A (FP-144G) | PRQP0144KB-A (FP-144J) | | PRQP0144KA-A (FP-144G) | |
| Operating Frequency / Supply Voltage | | 20MHz/4.5 to 5.5V | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85, –40 to 105 | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8S/2200 series

| Series | | H8S/2282 | | |
|---|---|---|---|---|
| Group | | H8S/2281 | H8S/2282 | H8S/2282F |
| Part No. | | HD6432281XXXF | HD6432282XXXF | HD64F2282F |
| Memory | ROM | 64K | 128K | |
| | RAM | 4K | | |
| | ROM Type (1) | M | | F |
| | Program Security | Yes | | |
| CPU | CPU | H8S/2000 core | | |
| | Basic Instructions | 65 | | |
| | Minimum Instruction Execution Time (ns) | 50 (@20MHz) | | |
| | Multiplier | – | | |
| | Multiply -Accumulate Instruction | – | | |
| DMA | DMAC (Channels) | – | | |
| | EXDMAC (Channels) | – | | |
| | DTC/DMACII | – | | |
| External Bus Expansion | Address Space (Bytes) | 16M | | |
| | Bus State Controller | – | | |
| | Bus Structure | – | | |
| | SDRAM Controller | – | | |
| | DRAM Controller | – | | |
| | Host Interface | – | | |
| Clock | Clock Generation Circuit | 2 circuits (Main clock, Sub clock) | | |
| | PLL | Yes ( x 1, x 2, x 4) | | |
| | Subclock | Yes (128 division) | | |
| | RTC | Yes (WDT for watch) | | |
| | Frequency Divider | 1/n (n=1, 2, 4, 8, 16, 32, 128) | | |
| | Power Save | Normal operating / Medium-speed / Sleep / Module stop / Watch / Sub active / Sub sleep / Software standby / Hardware standby | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | |
| | Sample and Hold | Yes | | |
| D/A Converter | Resolution x Channels | – | | |
| Timer | 8-bit Timer | – | | |
| | 16-bit Timer | 3 (TPU) | | |
| | 32-bit Timer | – | | |
| | Input Capture | 3 (shared with TPU) | | |
| | Output Compare | 3 (shared with TPU) | | |
| | PWM Output | 5 (shared with PWM, TPU) | | |
| | Real-Time Port | – | | |
| | Programmable Pulse Generator | – | | |
| | Event Counter | 3 (shared with TPU) | | |
| | 2-Phase Encoder Input | 5 (shared with PWM, TPU) | | |
| Watchdog Timer | | 2 | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | |
| $I^2C$-bus | | – | | |
| IEBus | | – | | |
| Smart Card/ SIM | | – | | |
| SSU / Special Serial I/O | | – | | |
| CAN | Channels | 1 | | |
| | Message Box | 16 | | |
| USB Function | | – | | |
| LPC/ ISA | | – | | |
| IrDA | | – | | |
| LCD | | 28seg x 4com | | |
| CRC Calculation Circuit | | – | | |
| I/O Ports | Input Only (Numbers) | 17 | | |
| | CMOS Output Only (Numbers) | 1 | | |
| | CMOS I/O (Numbers) | 64 | | |
| | High Voltage Port (Numbers) | – | | |
| | N-Channel Open Drain Port (Numbers) | – | | |
| | DTMF | – | | |
| | High Current Drive Port | – | | |
| | Pull-Up Resistor | – | | |
| | NMOS Push-Pull | 30 | | |
| External Interrupt pins | | 7 | | |
| Debug Function | Boundary Scan/JTAG | – | | |
| | On-Chip Debug | – | | |
| | On-Board Flash Program | – | | Yes |
| Other Functions | ROM Correction Function | – | | |
| | Other | 10-bit PWM Timer ( x 2) | | |
| PKG Code | | PRQP0100JE-B (FP-100A) | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.5 to 5.5V | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36014 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36010 | | | | | | | | H8/36011 | | | | | | | | H8/36012 | | | | | | | | | | | |
| Part No. | | HD64338010GXXXFZJ | HD64338010GXXXFYJ | HD64338010XXXFYJ | HD64338010XXXFZJ | HD64338010GXXXFYJE | HD64338010GXXXFZJE | HD64338010XXXFYJE | HD64338010XXXFZJE | HD64338011GXXXFZJ | HD64338011GXXXFYJ | HD64338011XXXFYJ | HD64338011XXXFZJ | HD64338011GXXXFYJE | HD64338011GXXXFZJE | HD64338011XXXFYJE | HD64338011XXXFZJE | HD64338012GXXXFYJ | HD64338012GXXXFZJ | HD64338012XXXFYJ | HD64338012XXXFZJ | HD64F38012FYJ | HD64F38012FZJ | HD64F38012GFYJ | HD64F38012GFZJ | HD64338012GXXXFYJE | HD64338012GXXXFZJE | HD64338012XXXFYJE | HD64338012XXXFZJE | HD64F38012FYJE | HD64F38012FZJE | HD64F38012GFYJE | HD64F38012GFZJE |
| Memory | ROM | 8K | | | | 16K | 8K | | | 12K | | | | 8K | 12K | | | 16K | | | | | | | | | | | |
| | RAM | 512 | | | | | | | | | | | | | | | | | | | | 2K | | | | 512 | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | | | | | | | | | F | | | | M | | | |
| | Program Security | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H core | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | 125 (@16MHz) | | | | 100 (@20MHz) | | | | 125 (@16MHz) | | | | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | |
| Clock | Clock Generation Circuit | 1 circuit (System clock) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sleep/Sub sleep / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | | | | | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | Yes | – | | | Yes | – | | | Yes | – | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 1 (Timer V) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 1 (Timer W) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | | | | | | | | | Yes | | | | – | | | Yes |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | | | | | | | | | – | | | | Yes | | | – |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | 16MHz/4.0 to 5.5V | | | | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz4.0 to 5.5V | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | | –40 to 105 | | | | | –40 to 85 | | | | –40 to 105 | | | | –40 to 85 | | | | | | | | –40 to 105 | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36014 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36013 | | | | | | | | H8/36014 | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64338013GXXFYJ | HD64338013GXXFZJ | HD64338013XXXFYJ | HD64338013XXXFZJ | HD64338013GXXFYJE | HD64338013GXXFZJE | HD64338013XXXFYJE | HD64338013XXXFZJE | HD64338014GXXFYJ | HD64338014GXXFZJ | HD64338014XXXFYJ | HD64338014XXXFZJ | HD64F38014FYJ | HD64F38014GFYJ | HD64F38014GFZJ | HD64F38014FZJ | HD64338014GXXFYJE | HD64338014GXXFZJE | HD64338014XXXFYJE | HD64338014XXXFZJE | HD64F38014FYJE | HD64F38014FZJE | HD64F38014GFYJE | HD64F38014GFZJE | | | | |
| Memory | ROM | 24K | | | | | | | | 32K | | | | | | | | | | | | | | | | | | | |
| | RAM | 1K | | | | | | | | | | | | 2K | | | | 1K | | | | 2K | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | F | | | | M | | | | F | | | | | | | |
| | Program Security | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H core | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | 125 (@16MHz) | | | | | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 1 circuit (System clock) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sleep / Sub sleep / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes | – | Yes | | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | Yes | – | | | Yes | – | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 1 (Timer V) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 1 (Timer W) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | Yes | | | | – | | | | Yes | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | – | | | | Yes | | | | – | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | | | –40 to 105 | | | | –40 to 85 | | | | | | | | –40 to 105 | | | | | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36024 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36022 | | | | | | | | | | | | | | H8/36023 | | | | | |
| Part No. | | HD64336022GKXXFYJ | HD64336022GKXXFZJ | HD64336022XXXXFYJ | HD64336022XXXXFZJ | HD64F36022FYJ | HD64F36022FZJ | HD64F36022GFYJ | HD64F36022GFZJ | HD64336022GKXXFYJE | HD64336022GKXXFZJE | HD64336022XXXXFYJE | HD64336022XXXXFZJE | HD64F36022FYJE | HD64F36022FZJE | HD64F36022GFYJE | HD64F36022GFZJE | HD64336023GKXXFYJ | HD64336023GKXXFZJ | HD64336023XXXXFYJ | HD64336023XXXXFZJ |
| Memory | ROM | 16K | | | | | | | | | | | | | | | | 24K | | | |
| | RAM | 512 | | 2K | | 512 | | 2K | | | | | | | | | | 1K | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | F | | M | | F | | | | | | | | | | M | | | |
| | Program Security | – | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H core | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | |
| Clock | Clock Generation Circuit | 1 circuit (System clock) | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sleep/Sub sleep / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | Yes | | – | | Yes | | – | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | Yes | | – | | | | Yes | | – | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 4 | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 1 (Timer V) | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 1 (Timer W) | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 | | | | | | | | | | | | | | | | | | | |
| $I^2C$-bus | | – | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 4 | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 30 | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 5 | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 9 | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | Yes | | – | | Yes | | | | | | | | | | – | | | |
| Other Functions | ROM Correction Function | Yes | | – | | Yes | | – | | | | | | | | | | Yes | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | –40 to 105 | | | | | | | | | | | | –40 to 85 | | –40 to 105 | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36024 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36024 | | | | | | | | | | | | | | |
| Part No. | | HD64338024GXXFYJ | HD64338024GXXFZJ | HD64338024XXXFYJ | HD64338024XXXFZJ | HD64F38024FYJ | HD64F38024FZJ | HD64F38024GFYJ | HD64F38024GFZJ | HD64338024GXXFYJE | HD64338024GXXFZJE | HD64338024XXXFYJE | HD64338024XXXFZJE | HD64F38024FYJE | HD64F38024FZJE | HD64F38024GFYJE | HD64F38024GFZJE |
| Memory | ROM | 32K | | | | | | | | | | | | | | | |
| | RAM | 1K | | | | 2K | | | | 1K | | | | 2K | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | | | M | | | | F | | | |
| | Program Security | – | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H core | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 1 circuit (System clock) | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | |
| | Subclock | – | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sleep/Sub sleep / Module standby / System clock devider | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | | | Yes | | – | | | | | | Yes | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | Yes | | – | | | | | | – | | | |
| A/D Converter | Resolution x Channels | 10-bit x 4 | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 1 (Timer V) | | | | | | | | | | | | | | | |
| | 16-bit Timer | 1 (Timer W) | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 3 | | | | | | | | | | | | | | | |
| $I^2C$-bus | | – | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 4 | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 30 | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 5 | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | |
| External Interrupt pins | | 9 | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | Yes | | | | – | | | | Yes | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | | Yes | | | | – | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | | | | | –40 to 105 | | | | | | | |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version ★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36037 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36032 | | | | | | | | | | | H8/36033 | | | | | | | | | | | |
| Part No. | | HD64338032GXXXFZJ | HD64338032GXXXGHJ | HD64338032XXXFZJ | HD64338032XXXHJ | HD64338032GXXXFZJE | HD64338032GXXXFZK | HD64338032GXXXHJE | HD64338032GXXXHK | HD64338032XXXFZJE | HD64338032XXXFZK | HD64338032XXXHJE | HD64338032XXXHK | HD64338033GXXXFZJ | HD64338033GXXXHJ | HD64338033XXXFZJ | HD64338033XXXHJ | HD64338033GXXXFZJE | HD64338033GXXXFZK | HD64338033GXXXHJE | HD64338033GXXXHK | HD64338033XXXFZJE | HD64338033XXXFZK | HD64338033XXXHJE | HD64338033XXXHK |
| Memory | ROM | 16K | | | | | | | | | | | | 24K | | | | | | | | | | | |
| | RAM | 1K | | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | | | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep(When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36037 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36034 | | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64338034GXXXFZJ | HD64338034GXXXHJ | HD64338034XXXFZJ | HD64338034XXXHJ | HD64F38034FZJ | HD64F38034GFZJ | HD64F38034GHJ | HD64F38034HJ | HD64338034GXXXFZJE | HD64338034GXXXFZK | HD64338034GXXXHJE | HD64338034GXXXHK | HD64338034XXXFZJE | HD64338034XXXFZK | HD64338034XXXHJE | HD64338034XXXHK | HD64F38034FZJE | HD64F38034FZK | HD64F38034GFZJE | HD64F38034GFZK | HD64F38034GHJE | HD64F38034GHK | HD64F38034HJE | HD64F38034HK |
| Memory | ROM | 32K | | | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 2K | | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | | | M | | | | | | | | F | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | | Yes | – | Yes | | – | | | | | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | Yes | | – | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | Yes | | | | – | | | | | | | | Yes | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | | Yes | | | | | | | | – | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36037 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36035 | | | | | | | | | | | H8/36036 | | | | | | | | | | | |
| Part No. | | HD64J36035GXXFZJ | HD64J36035GXXHJ | HD64J36035XXFZJ | HD64J36035XXHJ | HD64J36035GXXFZJE | HD64J36035GXXFZK | HD64J36035GXXHJE | HD64J36035GXXHJE | HD64J36035XXFZJE | HD64J36035XXFZK | HD64J36035XXHJE | HD64J36035XXHK | HD64J36036GXXFZJ | HD64J36036GXXHJ | HD64J36036XXFZJ | HD64J36036XXHJ | HD64J36036GXXFZJE | HD64J36036GXXFZK | HD64J36036GXXHJE | HD64J36036GXXHK | HD64J36036XXFZJE | HD64J36036XXFZK | HD64J36036XXHJE | HD64J36036XXHK |
| Memory | ROM | 40K | | | | | | | | | | | | 48K | | | | | | | | | | |
| | RAM | 2K | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | | | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | | | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36037 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36037 | | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64J36037GXXFZJ | HD64J36037GXXHJ | HD64J36037XXXFZJ | HD64J36037XXXHJ | HD64J36037GXXFZJE | HD64J36037GXXFZK | HD64J36037GXXHJE | HD64J36037GXXHK | HD64J36037XXXFZJE | HD64J36037XXXFZK | HD64J36037XXXHJE | HD64J36037XXXHK | HD64F36037FZJ | HD64F36037GFZJ | HD64F36037GHJ | HD64F36037HJ | HD64F36037FZJE | HD64F36037FZK | HD64F36037GFZJE | HD64F36037GFZK | HD64F36037GHJE | HD64F36037GHK | HD64F36037HJE | HD64F36037HK |
| Memory | ROM | 56K | | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 2K | | | | | | | | | | | | 3K | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | F | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | | | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | | | Yes | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | Yes | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | – | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36057 | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36054 | | | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64338054GXXXFZJ | HD64338054GXXXHJ | HD64338054XXXFZJ | HD64338054XXXHJ | HD64F38054FZJ | HD64F38054GFZJ | HD64F38054GHJ | HD64F38054HJ | HD64338054GXXXFZJE | HD64338054GXXXFZK | HD64338054GXXXHJE | HD64338054GXXXHK | HD64338054XXXFZJE | HD64338054XXXFZK | HD64338054XXXHJE | HD64338054XXXHK | HD64F38054FZJE | HD64F38054FZK | HD64F38054GFZJE | HD64F38054GFZK | HD64F38054GHJE | HD64F38054GHK | HD64F38054HJE | HD64F38054HK |
| Memory | ROM | 32K | | | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 2K | | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | | | M | | | | | | | | F | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | – | Yes | | | | – | | | | Yes | | | | – | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | Yes | | – | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | Yes | | | | – | | | | | | | | Yes | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | | Yes | | | | | | | | – | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/36057 | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/36057 | | | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64338057GXXXFZJ | HD64338057GXXXHJ | HD64338057XXXFZJ | HD64338057XXXHJ | HD64F38057FZJ | HD64F38057GFZJ | HD64F38057GHJ | HD64F38057HJ | HD64338057GXXXFZJE | HD64338057GXXXFZK | HD64338057GXXXHJE | HD64338057GXXXHK | HD64338057XXXFZJE | HD64338057XXXFZK | HD64338057XXXHJE | HD64338057XXXHK | HD64F38057FZJE | HD64F38057FZK | HD64F38057GFZJE | HD64F38057GFZK | HD64F38057GHJE | HD64F38057GHK | HD64F38057HJE | HD64F38057HK |
| Memory | ROM | 56K | | | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 2K | | | | 3K | | | | 2K | | | | | | | | 3K | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | | | M | | | | | | | | F | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | – | Yes | | | | – | | | | Yes | | | | – | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | Yes | | – | | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerB1, TimerV, Sub Timer) | | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 (Independent Oscillating Circuit Built In) | | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | – | | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | Yes | | | | – | | | | | | | | Yes | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | | Yes | | | | | | | | – | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3687 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3682 | | | | | | | | | | | H8/3683 | | | | | | | | | | |
| Part No. | | HD6436882GXXFZJ | HD6436882GXXHJ | HD6436882XXFZJ | HD6436882XXHJ | HD6436882GXXFZJE | HD6436882GXXFZK | HD6436882GXXHJE | HD6436882GXXHK | HD6436882XXFZJE | HD6436882XXFZK | HD6436882XXHJE | HD6436882XXHK | HD6436883GXXFZJ | HD6436883GXXHJ | HD6436883XXFZJ | HD6436883XXHJ | HD6436883GXXFZJE | HD6436883GXXFZK | HD6436883GXXHJE | HD6436883GXXHK | HD6436883XXFZJE | HD6436883XXFZK | HD6436883XXHJE | HD6436883XXHK |
| Memory | ROM | 16K | | | | | | | | | | | | 24K | | | | | | | | | |
| | RAM | 3K | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (RTC, TimerB1, TimerV) | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3687 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3684 | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD6436894GXXXFZJ | HD6436894GXXXHJ | HD6436894XXXFZJ | HD6436894XXXHJ | HD6436894GXXXFZJE | HD6436894GXXXFZK | HD6436894GXXXHJE | HD6436894GXXXHK | HD6436894XXXFZJE | HD6436894XXXFZK | HD6436894XXXHJE | HD6436894XXXHK | HD6F3894FZJ | HD6F3894GFZJ | HD6F3894GHJ | HD6F3894HJ | HD6F3894FZJE | HD6F3894FZK | HD6F3894GFZJE | HD6F3894GFZK | HD6F3894GHJE | HD6F3894GHK | HD6F3894HJE | HD6F3894HK |
| Memory | ROM | 32K | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 3K | | | | | | | | | | | | 4K | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | F | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (RTC, TimerB1, TimerV) | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | Yes | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | – | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3687 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3685 | | | | | | | | | | | H8/3686 | | | | | | | | | | | |
| Part No. | | HD64338953GXXFZJ | HD64338953GXXHJ | HD64338953XXXFZJ | HD64338953XXXHJ | HD64338953GXXFZJE | HD64338953GXXFZK | HD64338953GXXHJE | HD64338953GXXHK | HD64338953XXXFZJE | HD64338953XXXFZK | HD64338953XXXHJE | HD64338953XXXHK | HD64338963GXXFZJ | HD64338963GXXHJ | HD64338963XXXHJ | HD64338963XXXFZJ | HD64338963GXXFZJE | HD64338963GXXFZK | HD64338963GXXHJE | HD64338963GXXHK | HD64338963XXXFZJE | HD64338963XXXFZK | HD64338963XXXHJE | HD64338963XXXHK |
| Memory | ROM | 40K | | | | | | | | | | | | 48K | | | | | | | | | | |
| | RAM | 3K | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | | Yes | | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (RTC, TimerB1, TimerV) | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 85 | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3687 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3687 | | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD6433697GXXXFZJ | HD6433697GXXXHJ | HD6433697XXXFZJ | HD6433697XXXHJ | HD6473687FZJ | HD6473687GFZJ | HD6473687GHJ | HD6473687HJ | HD6433697GXXXFZJE | HD6433697GXXXFZK | HD6433697GXXXHJE | HD6433697GXXXHK | HD6433697XXXFZJE | HD6433697XXXFZK | HD6433697XXXHJE | HD6433697XXXHK | HD6473687FZJE | HD6473687FZK | HD6473687GFZJE | HD6473687GFZK | HD6473687GHJE | HD6473687GHK | HD6473687HJE | HD6473687HK |
| Memory | ROM | 56K | | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 4K | | | | | | | | | | | | | | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | F | | M | | | | F | | | | | | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | 125 (@16MHz) | | | | | | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | – | Yes | | – | | Yes | | – | | | | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | Yes | | – | | | | | | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (RTC, TimerB1, TimerV) | | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 2 (TimerZ) | | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | shared with Timer B1 | | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | shared with Timer Z | | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 2 | | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 45 | | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | Yes | | – | | | | Yes | | | | | | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | – | | Yes | | | | – | | | | | | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PRQP0064GB-A (FP-64A) | | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3694 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3690 | | | | | | | | | | | H8/3691 | | | | | | | | | | |
| Part No. | | HD64338903GXXFYJ | HD64338903GXXFZJ | HD64338903XXXFYJ | HD64338903XXXFZJ | HD64338903GXXFYJE | HD64338903GXXFYK | HD64338903GXXFZJE | HD64338903GXXFZK | HD64338903XXXFYJE | HD64338903XXXFYK | HD64338903XXXFZJE | HD64338903XXXFZK | HD64338913GXXFYJ | HD64338913GXXFZJ | HD64338913XXXFYJ | HD64338913XXXFZJ | HD64338913GXXFYJE | HD64338913GXXFYK | HD64338913GXXFZJE | HD64338913GXXGFZK | HD64338913XXXFYJE | HD64338913XXXFYK | HD64338913XXXFZJE | HD64338913XXXFZK |
| Memory | ROM | 8K | | | | | | | | | | | | 12K | | | | | | | | | |
| | RAM | 3K | | | | | | | | | | | | 0.5K | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | – | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | M | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | Yes (Closed) | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | H8/300H Core | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | 62 | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | 2 circuits (System clock, Sub clock) | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | – | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | – | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | – | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | 10-bit x 8 | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerA, TimerV, TimerW) | | | | | | | | | | | | 3 (TimerA, TimerV, TimerW) | | | | | | | | | |
| | 16-bit Timer | 1 (TimerW) | | | | | | | | | | | | 1 (TimerW) | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | shared with Timer W | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | shared with Timer V, Timer W | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | shared with Timer V, Timer W | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | – | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | – | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| $I^2C$-bus | | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | – | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | – | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | – | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | 8 | | | | | | | | | |
| | CMOS I/O (Numbers) | 29 | | | | | | | | | | | | 29 | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | – | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | 13 | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | – | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | 11 | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | – | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

## H8/300H Tiny series

| Series | | H8/3694 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3692 | | | | | | | | | | | H8/3693 | | | | | | | | | | |
| Part No. | | HD64338923GXXFYJ | HD64338923GXXFZJ | HD64338923XXFYJ | HD64338923XXFZJ | HD64338923GXXFYJE | HD64338923GXXFYK | HD64338923GXXFZJE | HD64338923GXXGFZK | HD64338923XXFYJE | HD64338923XXFYK | HD64338923XXFZJE | HD64338923XXFZK | HD64338933GXXFYJ | HD64338933GXXFZJ | HD64338933XXFYJ | HD64338933XXFZJ | HD64338933GXXFYJE | HD64338933GXXFYK | HD64338933GXXFZJE | HD64338933GXXGFZK | HD64338933XXFYJE | HD64338933XXFYK | HD64338933XXFZJE | HD64338933XXFZK |
| Memory | ROM | 16K | | | | | | | | | | | | 24K | | | | | | | | | |
| | RAM | 0.5K | | | | | | | | | | | | 1K | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | – | | | | | | | | | |
| | ROM Type (1) | M | | | | | | | | | | | | M | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | Yes (Closed) | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | H8/300H Core | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | 62 | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | | | | 100 (@20MHz) | | 125 (@16MHz) | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | 2 circuits (System clock, Sub clock) | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | – | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | – | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | – | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | Yes | | – | | | | | | | | Yes | – | Yes | | – | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | | | | | | | | | Yes | – | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | 10-bit x 8 | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerA, TimerV, TimerW) | | | | | | | | | | | | 3 (TimerA, TimerV, TimerW) | | | | | | | | | |
| | 16-bit Timer | 1 (TimerW) | | | | | | | | | | | | 1 (TimerW) | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | shared with Timer W | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | shared with Timer V, Timer W | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | shared with Timer V, Timer W | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | – | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | – | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| $I^2C$-bus | | 1 | | | | | | | | | | | | 1 | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | – | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | – | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | – | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | 8 | | | | | | | | | |
| | CMOS I/O (Numbers) | 29 | | | | | | | | | | | | 29 | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | – | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | 13 | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | – | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | 11 | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| | On-Board Flash Program | – | | | | | | | | | | | | – | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | | | | | | | | | Yes | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | | | | 20MHz/4.0 to 5.5V | | 16MHz/4.0 to 5.5V | | | | | | | |
| Operating Ambient Temperature (˚C) | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | | | –40 to 85 | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

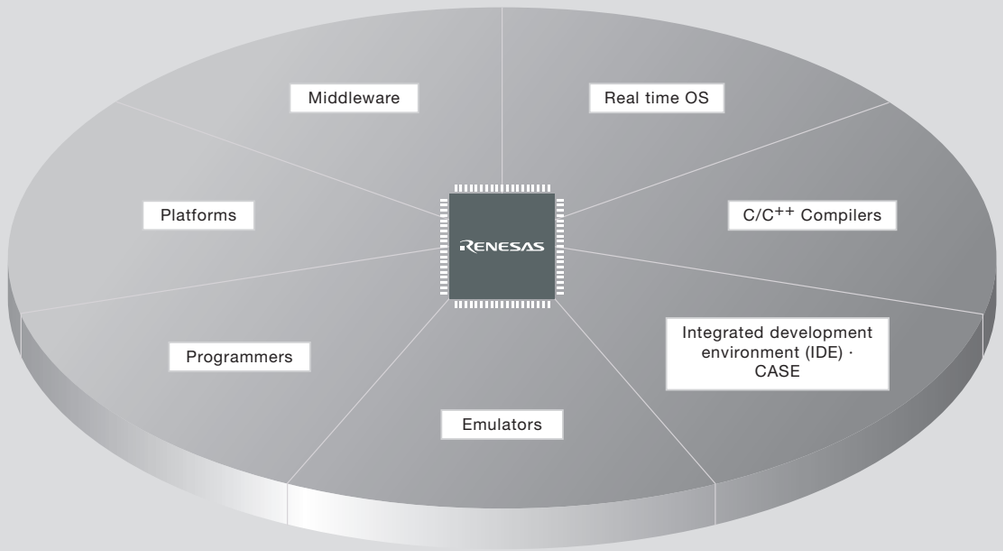
## H8/300H Tiny series

| Series | | H8/3694 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | | H8/3694 | | | | | | | | | | | | | | | | | | | | | |
| Part No. | | HD64338946GXXFVJ | HD64338946GXXFZJ | HD64338946XXXFVJ | HD64338946XXXFZJ | HD6473694FVJ | HD6473694FZJ | HD6473694GFVJ | HD6473694GFZJ | HD64338946GXXFVJE | HD64338946GXXFYK | HD64338946GXXFZJE | HD64338946GXXFZK | HD64338946XXXFVJE | HD64338946XXXFYK | HD64338946XXXFZJE | HD64338946XXXFZJK | HD6473694FVJE | HD6473694FYK | HD6473694FZJE | HD6473694FZK | HD6473694GFVJE | HD6473694GFYK | HD6473694GFZJE | HD6473694GFZK |
| Memory | ROM | 32K | | | | | | | | | | | | | | | | | | | | | |
| | RAM | 1K | | | | 2K | | | | 1K | | | | 2K | | | | | | | | | |
| | EEPROM (Bytes) | – | | | | | | | | | | | | | | | | | | | | | |
| | ROM Type (1) | M | | | | F | | | | M | | | | F | | | | | | | | | |
| | Program Security | Yes (Closed) | | | | | | | | | | | | | | | | | | | | | |
| CPU | CPU | H8/300H Core | | | | | | | | | | | | | | | | | | | | | |
| | Basic Instructions | 62 | | | | | | | | | | | | | | | | | | | | | |
| | Minimum Instruction Execution Time (ns) | 100 (@20MHz) | | | | | | | | 125 (@16MHz) | | | | | | | | | | | | | |
| Clock | Clock Generation Circuit | 2 circuits (System clock, Sub clock) | | | | | | | | | | | | | | | | | | | | | |
| | PLL | – | | | | | | | | | | | | | | | | | | | | | |
| | Subclock | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Chip Oscillator | – | | | | | | | | | | | | | | | | | | | | | |
| | Oscillation Stop Detection | – | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Divider | 1/n (n=1, 8, 16, 32, 64) | | | | | | | | | | | | | | | | | | | | | |
| | Power Save | Standby / Sub active (When using sub clock at 32kHz) / Sleep / Sub sleep (When using sub clock at 32kHz) / Module standby / System clock devider | | | | | | | | | | | | | | | | | | | | | |
| Voltage Detection | Power-On Reset/POR | Yes | – | | | Yes | | | | – | | | | Yes | | | | | | | | | |
| | LVD (Low Voltage Detection) | Yes | – | | | Yes | | | | – | | | | | | | | | | | | | |
| A/D Converter | Resolution x Channels | 10-bit x 8 | | | | | | | | | | | | | | | | | | | | | |
| | Sample and Hold | Yes | | | | | | | | | | | | | | | | | | | | | |
| Timer | 8-bit Timer | 3 (TimerA, TimerV, TimerW) | | | | | | | | | | | | | | | | | | | | | |
| | 16-bit Timer | 1 (TimerW) | | | | | | | | | | | | | | | | | | | | | |
| | Input Capture | shared with Timer W | | | | | | | | | | | | | | | | | | | | | |
| | Output Compare | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | |
| | PWM Output | shared with Timer V, Timer W | | | | | | | | | | | | | | | | | | | | | |
| | Event Counter | – | | | | | | | | | | | | | | | | | | | | | |
| | 3-Phase Inverter Control | – | | | | | | | | | | | | | | | | | | | | | |
| Watchdog Timer | | 1 | | | | | | | | | | | | | | | | | | | | | |
| Serial Interface | Clock Sync. / Clock Async. | 1 | | | | | | | | | | | | | | | | | | | | | |
| I²C-bus | | 1 | | | | | | | | | | | | | | | | | | | | | |
| SSU / Special Serial I/O | | – | | | | | | | | | | | | | | | | | | | | | |
| CAN | Channels | – | | | | | | | | | | | | | | | | | | | | | |
| | Message Box | – | | | | | | | | | | | | | | | | | | | | | |
| I/O Ports | Input Only (Numbers) | 8 | | | | | | | | | | | | | | | | | | | | | |
| | CMOS I/O (Numbers) | 29 | | | | | | | | | | | | | | | | | | | | | |
| | High Voltage Port (Numbers) | – | | | | | | | | | | | | | | | | | | | | | |
| | Pull-Up Resistor | 13 | | | | | | | | | | | | | | | | | | | | | |
| | NMOS Push-Pull | – | | | | | | | | | | | | | | | | | | | | | |
| External Interrupt pins | | 11 | | | | | | | | | | | | | | | | | | | | | |
| Debug Function | On-Chip Debug | Yes | | | | | | | | | | | | | | | | | | | | | |
| | On-Board Flash Program | – | | | | Yes | | | | – | | | | Yes | | | | | | | | | |
| Other Functions | ROM Correction Function | Yes | | | | – | | | | Yes | | | | – | | | | | | | | | |
| PKG Code | | PLQP0064KB-A (FP-64K), PLQP0048KC-A (FP-48B) | | | | | | | | | | | | | | | | | | | | | |
| Operating Frequency / Supply Voltage | | 20MHz/4.0 to 5.5V | | | | | | | | 16MHz/4.0 to 5.5V | | | | | | | | | | | | | |
| Operating Ambient Temperature (°C) | | –40 to 85 | | | | | | | | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 | –40 to 105 | –40 to 125 |

Notes (1): F : Flash memory version L : ROM less version M : Mask ROM version O : One time PROM version Qz : Qz ROM version

★ : New products ★★ : Under development

- Development tools to make the most use of Renesas microcomputers
- Strong alliances with many partner vendors
- Reliable support services for user system development




Renesas Tools Web Site
http://www.renesas.com/tools

## Renesas IDE High-Performance Embedded Workshop

- Seamless Development Environment
  - Designing, coding, evaluating and debugging tools combined and placed under unified management
  - Automated compiling, assembling and linking
- Test Support Facility
  - Macro-Recording Support Facility in recording and rerunning build and debugging operations
  - Information in result window for test macro running saved as test image file for comparison
- Auto update function (AutoUpdate Utility)
  - Automated process of detecting and immediately updating latest software tools on Internet
- Document update function (Document-updater)
  - Automated process of detecting and downloading from Internet of latest documentation regarding microcomputers used in current project
- Links with Products Available from Partner Vendors (CASE tool, etc.)

## Renesas Compilers

- Compliance with Globally Accepted ANSI Standards
- Abundant Advanced and Optional Features
  - #pragma extension and keywords (function/variable control)
  - Intrinsic function (system command/special command statement) etc.
- Powerful Optimization Functions
- MISRA-C Rule Inspection Tool (SQMlint) Embeddable

## Renesas µITRON

- Fast and Compact µITRON-Based OS
- Smooth System Construction by Configurator
- Many System Calls
- OS Debugging

## Renesas' Lineup of Emulators

- Selection of various emulators for users' specific needs
- Ease of operation from High-Performance Embedded Workshop

: Supported microcomputers (for in-vehicle LAN)(1)

Function

### On-Chip Debugging Emulators

**Cost-effective on-chip debugging (OCD) emulator**

E10A-USB

SuperH family, H8S family, H8SX family

- Enables user system debugging in near-final product condition
- USB bus-powered, no need for external power supply
- PC interface: USB

WEB http://www.renesas.com/e10a_usb

**Comprehensive support for affordable development environment for Tiny series**

E8

M16C family, H8 family

- Functionality as Flash memory programmer
- USB bus-powered, no need for external power supply
- PC interface: USB

WEB http://www.renesas.com/e8

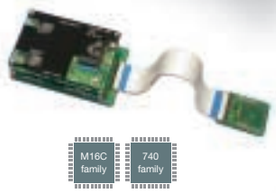
**Emulators supporting debugging of actual M32R-family chip. Choose from three types according to your needs.**

M32100T5-SDI-E
M32100T3-SDI-E
M32100T-EZ-E

- With JTAG connected, these emulators can keep pace with high-speed operation of M32R-family MCUs.
- Connected in-circuit, these emulators provide enhanced debugging capability comparable to that of full-feature emulators (not available from M32100T-EZ-E).
- USB bus-powered; no need for external power supply (M32100T-EZ-E only)
- PC interface: USB

WEB http://www.renesas.com/m32100t_ez

### Compact Emulators



**In-circuit emulators full-featured, low-priced and compact.**

M30850T3-CPE(2)
M3062PT3-CPE
M3028BT2-CPE(3)
M38000T2-CPE
R0E521000CPE00

M16C family, 740 family

- It comes standard with such development tools as integrated development environment, C compiler, assembler and debugger.
- Although compact, these emulators have real-time trace and other features sufficient for full-scale development.
- PC interface: USB

WEB http://www.renesas.com/cpe

### High-End Emulators

**This high-function emulator supports maximum operating frequency of 100 MHz.**

E6000H

- Comes with enhanced debugging functions such as C source level debugging, trace and break.
- Provides non-site-specific debugging environment under all operating circumstances.
- PC interfaces: PCI bus, PC card bus, LAN and USB

WEB http://www.renesas.com/e6000h

SuperH family, H8SX family

**This high-function emulator is equipped with on-chip debugging (OCD) and bus-trace capabilities.**

E200F

SuperH family

- Achieves fast downloading of programs via USB 2.0 (high speed).
- Fully supports hardware debugging through external bus trace capability.
- Enables performance measurement without affecting program execution time.
- PC interface: USB

WEB http://www.renesas.com/e200f

**This high-function emulator supports maximum operating frequency of 33 MHz.**

E6000

SuperH family, H8 family, H8S family

- Comes with enhanced debugging functions such as C source level debugging, trace and break.
- PC interfaces: PCI bus, PCMCIA bus, LAN and USB

WEB http://www.renesas.com/e6000

**High-function, full-feature emulator for M16C family**

PC7501

M16C family

- Provides further extension of already abundant debugging features of PC4701U.
- Compatible with variety of microcomputers through replacement of emulation probe and other parts.
- PC interfaces: LPT parallel, USB and LAN

WEB http://www.renesas.com/pc7501

Evaluation and small to medium-scale development

Medium to large-scale development

Notes(1): See development environment list for detailed information on compatible series and groups. In addition to in-vehicle LAN microcomputers, other compatible microcomputers are also available. For further information, visit our web site.
Notes(2): M30850T3-CPE is successor variety to M30850T2-CPE.
Notes(3): M3028BT2-CPE is successor variety to M30290T2-CPE.

## Development tools for SuperH™ family

| MCU | | | Software tools | | | | Hardware tools | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Low-cost model *5 | High-end model *5 | | | |
| CPU Core | Series | Group | RTOS (µITRON) | C/C++ compiler package | Simulator debugger | IDE | Emulator *6 *13 | Emulator | Host interface board | User system interface board or evaluation chip board | Option |
| SH-4A | SH7780 | SH7785** | (HI7750/4) R0R40775TRW02w *1 (HI7300/PX) R0R50730PRW01w *2 | C/C++ Compiler Package for SuperH Family (MISRA C *4) | | | (E10A-USB) HS0005KCU01H/02H | (E200F) R0E0200F2EMU00* | Included in emulator | – | R0E200F0ETU00 *10 (External bus trace unit) R0E0200F0EPU00 (Extended profile unit) |
| | | SH7781** SH7780* | | | | | | (E200F) R0E200F0EMU00 | | | |
| | | SH7763** | | | | | | – | – | | – |
| SH-4 | SH7750 | SH7760 SH7751R SH7751 SH7750S SH7750R | (HI7750/4) R0R40775TRW02w *1 | | | | | – | – | | – |
| SH2A-FPU | SH7260 | SH7261** | (HI7000/4) R0R40700TRW02w *1 *3 | | | | (E10A-USB) HS0005KCU01H/02H *14 | – | – | | – |
| | | SH7263** | | | | | | – | – | | – |
| SH-2 | SH7147 | SH7147** | | | | | – | (E200F) R0E0200F1EMU00 *12 | Included in emulator | R0E0200F0ACC00 (Trace cable) + R0E571470VKK00 (Evaluation chip unit) + R0E571470CFK00 (FP-100U) *15 (User interface board) | R0E0200F1ETU00 *11 (External bus trace unit) R0E0200F0EPU00 (Extended profile unit) R0E0200F1MSR00 (8MByte) *11 (Emulation Memory Unit) R0E0200F1MSR01 (16MByte) *11 (Emulation Memory Unit) |
| | | SH7142** | | | | | | (E200F) R0E0200F1EMU00 *12 *14 | | | |
| SH-2 | SH7050 | SH7059** | | | | | – | (E6000H) HS7059EPH60H *7 | HS6000EIP02H *9 (PC-Card) or HS6000EIC02H (PCI-Card) or HS6000ELN01H (LAN-Adapter) or HS6000EIU02H (USB-Adapter) | HS7058ECF61H (FP-256H) or HS7058ECB61H (BP-272) | – |
| SH-2E | | SH7058S | | | | | | (E6000H) HS7059EPH60H *7 | | HS7058ECF61H (FP-256H) or HS7058ECB61H (BP-272) | – |
| | | SH7058 | | | | | | (E6000H) HS7058EPH60H *7 | | HS7058ECF61H (FP-256H) or HS7058ECB61H (BP-272) | |
| | | SH7055 | | | | | | (E8000) HS8000EST03H + HS7055EDD81H | | HS7055EBK81H + HS7055ECF81H (FP-256H) | |
| SH-2 | SH7047 | SH7109 SH7107 SH7105 SH7049 | | | | | | (E6000H) HS7046EPH60H *7 | | HS7047ECH61H (FP-100M) | – |
| | | SH7047 | | | | | (E10A-USB) HS0005KCU01H/02H *7 | | | | |

*1 w="1": Evaluation contract, one host machine
w="5": Evaluation contract, up to 5 host machines
w="A": Evaluation contract, up to 10 host machines
w="K": Mass production contract, up to 1000 user systems
w="U": Mass production contract, no limit on the number of user systems
w="Z": Mass production contract, no limit on the number of user systems, with kernel source code
Different type names may be used in some regions. In this case, please ask your local Renesas office about the ordering number.
*2 HI7300/PX supports SH-4A and SH4AL-DSP MCUs.
*3 FPU of SH-2E (such as SH7055) is not supported.
*4 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions.
*5 Emulator software is bundled with emulator.
*6 HS0005KCU01H uses only H-UDI function of MCU.
HS0005KCU02H uses H-UDI function and AUD function of MCU.
*7 Only flash memory version supported. Cannot use ROM-less mode.
*8 Set package with HS6000EIU02H (USB-Adapter) is also available. As for the set package name, "-U" is added to the end of the type name of emulator. e.g. HS7046EPH60H-U
*9 Can be used with HS6000EIP01H.
*10 Trace cable (R0E0200F0ACC00) is bundled.
*11 Trace cable is required. When two or more optional products are attached, only one trace cable can be used.
*12 Evaluation chip board, Trace cable, and User interface board are required.
*13 For HS0005KCU02H, an optional user interface cable HS0005ECK01H to connect Mictor38pin is available.
*14 Emulator software is under development.
*15 Evaluation chip board is required.
★ New MCU
★★ Under development/evaluation

## Product type names of license tools for adding device groups for emulator E10A-USB

| Target device | | License tool |
|---|---|---|
| SH-4A device group | SH7763/SH7770/SH7774/SH7780/SH7781/SH7785 | HS7770KCU01SR |
| SH-4 device group | SH7750S/SH7750R/SH7751/SH7751R/SH7760/SH7750Rbase_SOC | HS7751KCU01SR |
| SH-2A device group | SH7201/SH7203**/SH7206/SH7211F/SH7261/SH7263** | HS7206KCU01SR |
| SH-2 device group | SH7615/SH7616/SH7047F/SH7144F/SH7145F/SH7650/SH7606/SH7618/SH7618A/ SH7619/SH7124F/SH7125F/SH7083F/SH7084F/SH7085F/SH7086F/SH7146F/SH7149F/ SH/Tiny | HS7047KCU01SR |

★★ Under development

## List of development tools for M32R Family

| MCU | | | Software tools | | | | Hardware tools | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Group | MCU | RTOS | C/C++ compiler package | Simulator debugger | IDE | Emulator debugger | Emulator *9 | Accessory *10 | Starter kit | Programmer *12 |
| M32R/ECU | 32176 | M32176FxVFP | M3T-MR32R/4 *1 | M3T-CC32R *2 (MISRA C *3) | M3T-PD32RSIM *4 | High-performance Embedded Workshop *5 | Included in emulator *6 | M32100T5-SDI-E *7<br>M32100T3-SDI-E *7<br>M32100T-EZ-E *7<br>M32100T2-SDI-E *8 | M32176T-PTC | M3A-2152G52A *11 (M32176F4VFP is mounted.) | NET IMPRESS *13<br>EFP-I/EFP-S2/EFP-S2V *14<br>Y1000-8T *15 |
| | | M32176FxTFP | | | | | | | M32176T-PTC | | |
| | 32185 | M32185F4VFP** | | | | | | | M32186T2-PTC** | M3A-2154G52B*11 (M32192F8VFP is mounted. M32186F8VFP is included. ) | NET IMPRESS *13**<br>EFP-I/EFP-S2/EFP-S2V *14**<br>Y1000-8T *15** |
| | 32186 | M32186F8VFP* | | | | | | | | | |
| | 32192 | M32192F8VFP<br>M32192F8UFP<br>M32192F8TFP<br>M32192F8VWG**<br>M32192F8UWG**<br>M32192F8TWG** | | | | | | | M32192T2-PTC | | |
| | 32195 | M32195F4VFP**<br>M32195F4UFP**<br>M32195F4TFP** | | | | | | | M32192T2-PTC** | | |
| | 32196 | M32196F8VFP*<br>M32196F8UFP*<br>M32196F8TFP* | | | | | | | | | |

*1 M3T-MR32R/4 is the generic name for µITRON4.0 Specification real-time OS development kit (M3T-MR32RK/4) and mass production contract (M3T-MR32RS/4).
*2 M3T-CC32R includes integrated development environment (High-performance Embedded Workshop), C/C++ compiler, assembler and simulator debugger M3T-PD32RSIM.
*3 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions.
*4 Simulator debugger is included with C/C++ compiler package.
*5 Integrated development environment (High-performance Embedded Workshop) is included with C/C++ compiler package.
*6 Emulator debugger is bundled with emulator.
*7 Emulator debugger M3T-PD32RM is bundled.
*8 Emulator debugger M3T-PD32R is bundled.
*9 Emulators by partner vendors are also available. For details, visit Renesas website at: http://www.renesas.com/partners
*10 M32100T5-SDI-E, M32100T3-SDI-E and M32100T2-SDI-E need no accessory tools in JTAG connection. They are directly connected to user system. M32100T-EZ-E is for JTAG-connection only, and directly connected user system without any accessories.
*11 Please replace the pre-mounted MCU with your target MCU.
*12 For detailed information concerning programmers, supported MCUs, and applicability to mass-production or production equipment, please contact the concerned manufacturers.
*13 Programmer made by Yokogawa Digital Computer Corporation.
*14 Programmer made by Suisei Electronics System Co., Ltd.
*15 Programmer made by Wave Technology Co., Ltd.
★ New product
★★ Under development or evaluation: product name may be changed. When MCU is under development, restrictions and other limitation for tools may be arisen.

## Operating environment for M32R Family software tools

| Product type | Product name | Host machine (OS) |
|---|---|---|
| RTOS | M3T-MR32R/4 *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| C/C++ compiler package | M3T-CC32R *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| MISRA C rule checker | SQMlint *3 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| Simulator debugger | M3T-PD32RSIM *4 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| IDE | High-performance Embedded Workshop *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | M3T-PD32RM *6 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000) |
| | M3T-PD32R *7 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-MR32R/4 is the generic name for _ITRON4.0 Specification real-time OS development kit (M3T-MR32RK/4) and mass production contract (M3T-MR32RS/4).
*2 M3T-CC32R includes High-performance Embedded Workshop, C/C++ compiler, assembler and simulator debugger M3T-PD32RSIM.
*3 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions.
*4 Emulator debugger M3T-PD32RM is bundled with C/C++ compiler package.
*5 High-performance Embedded Workshop is bundled with C/C++ compiler package.
*6 M3T-PD32RM is bundled with M32100T5-SDI-E, M32100T3-SDI-E and M32100T-EZ-E emulators.
*7 M3T-PD32R is bundled with M32100T2-SDI-E emulator.

## Development Tools for M32C/80 Series

| MCU | | Introductory tools | Software tools | | | Hardware tools | | | | Programming tool |
|---|---|---|---|---|---|---|---|---|---|---|
| Series | Group | Starter kit | RTOS | C compiler package | IDE | Onchip debugging emulator | Compact emulator | In-circuit emulator: Emulator | In-circuit emulator: Emulation probe | Flash programmer |
| M32C/80 | M32C/80 | – | M3T-MR308/4 *2 | M3T-NC308WA *3 (MISRA C *4) | High-performance Embedded Workshop *5 | – | M30850T3-CPE *7*12 | PC7501 *8 | M30850T2-EPB | – |
| | M32C/81 | | | | | | – | | M30830T-EPB *9 | |
| | M32C/82 | | | | | | | | | |
| | M32C/83 | M3A-0835 or M3A-0836 | | | | | | | | M3A-0655 or M3A-0806 |
| | M32C/84 | Renesas Starter Kit for M32C/87 (type name R0K330879S000BE) *1 | | | | E8 *6 | M30850T3-CPE *7 *12 | | M30850T2-EPB | Flash Development Toolkit *10 (E8 emulator is necessary at programming.) or M3A-0806 *11 |
| | M32C/85 | | | | | | | | | |
| | M32C/87 | | | | | | M30870T2-CPE *7 | | M30870T-EPB | Flash Development Toolkit *10 (E8 emulator is necessary at programming.) |
| | M32C/88 | | | | | | – | | M30880T-EPB | |

*1 CPU board, Onchip debugging emulator E8, software (Integrated development environment High-performance Embedded Workshop, C compiler package M3T-NC308WA free evaluation version, E8 emulator debugger, Flash Development Toolkit free evaluation version) and others are included.
*2 M3T-MR308/4 is the generic name for real-time OS development kit (M3T-MR308/4K) and mass production contract (M3T-MR308/4S).
*3 M3T-NC308WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*4 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*5 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*6 E8 emulator includes software (High-performance Embedded Workshop, E8 emulator debugger, Evaluation version of C compiler package, Evaluation version of Flash Development Toolkit). Depending on the time of delivery, the bundled software you purchased may include the previous version.
*7 Compact emulator includes software (Emulator debugger, Evaluation version of C compiler package M3T-NC308WA). Depending on the time of delivery, the bundled software you purchased may include the previous version.
*8 PC7501 emulator bundles emulator debugger.
*9 For the use of 20 MHz or less, you can use the combination of emulator debugger M3T-PD308, emulator PC4701U and emulation pod M30830T-RPD-E.
*10 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.
*11 Data flash area are not available on M32C/84 and M32C/85 groups.
*12 M30850T3-CPE is the successor product of the M30850T2-CPE. With the optional emulation memory board R0E330850MSRC0, emulation memory allocation function and micro-processor mode are available.

## Accessories for M32C/80 Series

| MCU | | Accessories | | | |
|---|---|---|---|---|---|
| Series | Group | Package type | Package name | Previous code | Recommended accessories *1 |
| M32C/80 | M32C/80 | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) |
| | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) |
| | M32C/81<br>M32C/82<br>M32C/83<br>M32C/84<br>M32C/85<br>M32C/87<br>M32C/88 | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) |
| | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) |
| | | 144 pin 0.5 mm pitch LQFP | PLQP0144KA-A | 144P6Q-A | M3T-FLX-144NSD (optional) |

*1 Various other useful accessory tool products are also available. For more information visit http://www.renesas.com/accessory.
(optional): Not included with compact emulator, emulation pod or probe. Purchase it separately.

## Operating Environment for M32C/80 Series

| Product type | Product name | Host machine (OS) |
|---|---|---|
| RTOS | M3T-MR308/4 *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| C compiler package | M3T-NC308WA *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| MISRA C rule checker | SQMlint *3 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| IDE | High-performance Embedded Workshop *4 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Simulator debugger | Simulator Debugger for M32C Series *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | PC7501 Emulator Debugger for M32C Series *6<br>Compact Emulator Debugger for M32C Series *6<br>FoUSB/UART Debugger for M32C Series *6<br>E8 Emulator Software *6 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Flash and PROM Programming | Flash Development Toolkit *7 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-MR308/4 is the generic name for real-time OS development kit (M3T-MR308/4K) and mass production contract (M3T-MR308/4S).
*2 M3T-NC308WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*4 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5 Simulator debugger is included with C compiler package.
*6 Emulator debugger is bundled with emulators.
*7 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.

## Development tools for M16C/60, 30, and 10 Series

| MCU | | | Introductory tools | Software tools | | | Hardware tools | | | | Programming tool |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Group | MCU | Starter kit | RTOS | C compiler package | IDE | Onchip debugging emulator | Compact emulator *7 | In-circuit emulator | | Flash programmer *12 |
| | | | | | | | | | Emulator *8 | Emulation probe or pod | |
| M16C/60 | M16C/62A | | M3A-0654G02 | M3T-MR30/4 *2 | M3T-NC30WA *3 (MISRA C *4) | High-performance Embedded Workshop *5 | M3A-0665 | M30620T-CPE | PC4701U | M30620T2-RPD-E | M3A-0665 or M3A-0806 *13 *14 |
| | M16C/62M | | M3A-0654G01 | | | | | – | | M30620TL-RPD-E | |
| | M16C/62N | | – | | | | | | | M3062NT3-RPD-E | |
| | M16C/62P | | Renesas Starter Kit for M16C/62P (type name: R0K33062PS000BE) *1 | | | | E8 *6 or M3A-0665 | M3062PT3-CPE *16 | PC7501 | M3062PT2-EPB *9 | Flash Development Toolkit *15 (E8 emulator is necessary at programming), M3A-0665, M3A-0806 *13 |
| | M16C/6N | M306N4<br>M306N5 | – | | | | E8 *6 or M3A-0665 | – | PC7501 | M306NKT-EPB *10 | Flash Development Toolkit *15** (E8 emulator is necessary at programming) or M3A-0665, M3A-0806 *13 |
| | | M306NK<br>M306NL<br>M306NM<br>M306NN | Renesas Starter Kit for M16C/6NK (type name: R0K3306NKS000BE) *1 | | | | | | | | |
| M16C/30 | M16C/30 | M30302 | – | | | | – | – | PC4701U | M30620T2-RPD-E | – |
| | M16C/30L | | | | | | | | | M3062NT3-RPD-E | |
| | M16C/30P | | | | | | E8 *6 | M3062PT3-CPE *16 | PC7501 | M3062PT2-EPB *9 | Flash Development Toolkit *15** (E8 emulator is necessary at programming) |
| M16C/10 | M16C/1N | M301N2 | | | | | – | – | PC4701U | M30100T3-RPD-E + M301N2T-PRB *11 | M3A-0806 *13 |

*1 CPU board, Onchip debugging emulator E8, software (Integrated development environment High-performance Embedded Workshop, C compiler package M3T-NC30WA free evaluation version, E8 emulator debugger, Flash Development Toolkit free evaluation version) and others are included.
*2 M3T-MR30 is the generic name for real-time OS development kit (M3T-MR30K) and mass production contract (M3T-MR30S).
*3 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler, and simulator debugger.
*4 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*5 High-performance Embedded Workshop is included with C compiler package and emulator debugger.
*6 E8 emulator includes software (High-performance Embedded Workshop, E8 emulator debugger, Evaluation version of C compiler package, Evaluation version of Flash Development Toolkit). Depending on the time of delivery, the bundled software you purchased may include the previous version.
*7 Compact emulator includes software (Emulator debugger, Evaluation version of C compiler package M3T-NC30WA). Depending on the time of delivery, the bundled software you purchased may include the previous version.
*8 You can download the latest version from Web.
*9 When the operating frequency is 16 MHz or less, you can use the combination of PC4701U and M3062PT3-RPD-E.
*10 When the operating frequency is 16 MHz or less, you can use the combination of PC4701U and M306NKT3-RPD-E for M306N4 and M306NK.
*11 Pod probe for the M16C/1N group.
*12 Programmers by partner vendors are also available. For detailed information concerning programmers, supported MCUs, and applicability to mass-production or production equipment, please contact the concerned manufacturers.
*13 Data flash area are not available.
*14 For OTP MCUs of the M16C/62A, you can use the PROM programming adapter PCA7413F-80 for PRQP0080JA-A(previous code 80P6S-A) package and PCA7412F-100 for PRQP0100JB-A(previous code 100P6S-A) package with R4945/R4945A programmers(ADVANTEST CORPORATION).
*15 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.
*16 With the optional emulation memory board R0E33062PMSRC0, emulation memory allocation function and micro-processor mode are available.
★★ Under development

## Compact Emulators for M16C/62P and M16C/30P Group

| MCU | | Target MCU | | | Product type name | Components *1 |
|---|---|---|---|---|---|---|
| Series | Group | Package type | Package name | Previous code | | |
| M16C/60<br>M16C/30 | M16C/62P<br>M16C/30P | 80 pin 0.65 mm pitch QFP | PRQP0080JA-A | 80P6S-A | M3062PT3-CPE-1 | Compact emulator M3062PT3-CPE *2<br>Converter board M3062PT-80FPB |
| | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3062PT3-CPE-2 | Compact emulator M3062PT3-CPE *2<br>Converter board M30800T-PTC<br>IC socket IC61-1004-051 |
| | | | | | M3062PT3-CPE-5 | Compact emulator M3062PT3-CPE *2<br>Converter board M3T-F160-100NRB |
| | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3062PT3-CPE-3 | Compact emulator M3062PT3-CPE *2<br>Converter board M3T-F160-100NSD |
| | | 128 pin 0.5 mm pitch LQFP | PLQP0128KB-A | 128P6Q-A | M3062PT3-CPE-4 | Compact emulator M3062PT3-CPE *2<br>Converter board M3T-FLX-128NRD |

*1 On debugging, compact emulator with an MCU-dependent converter board is connected to a user system. Compact emulator and converter board are also sold separately.
*2 With the optional emulation memory board R0E33062PMSRC0, emulation memory allocation function and micro-processor mode are available.

## Accessories for M16C/60, M16C/30, and M16C/10 Series

| MCU | | | Accessories | | | | |
|---|---|---|---|---|---|---|---|
| Series | Group | MCU | Package type | Package name | Previous code | Recommended accessories *1 | Emulator |
| M16C/60 | M16C/62A<br>M16C/62M | | 80 pin 0.65 mm pitch QFP | PRQP0080JA-A | 80P6S-A | M3T-FLX-100LCC (included)<br>+ M3T-100LCC-80QSB (optional) | PC4701U |
| | | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-FLX-100NSD (optional) | |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-FLX-100NRB (optional) | |
| | M16C/62N | | 80 pin 0.65 mm pitch QFP | PRQP0080JA-A | 80P6S-A | M3062PT-80FPB (optional) | |
| | | | 100 pin 0.4 mm pitch TQFP | PTQP0100LB-A | 100PFB-A | M3T-F160-100NSE (optional) | |
| | | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) | |
| | M16C/62P | | 80 pin 0.65 mm pitch QFP | PRQP0080JA-A | 80P6S-A | M3062PT-80FPB (optional) | PC7501 |
| | | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) | |
| | | | 128 pin 0.5 mm pitch LQFP | PLQP0128KB-A | 128P6Q-A | M3T-F160-128NRD (optional) | |
| | M16C/6N | M306N4<br>M306N5 | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) | |
| | | M306NK<br>M306NL | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | |
| | | M306NM<br>M306NN | 128 pin 0.5 mm pitch LQFP | PLQP0128KB-A | 128P6Q-A | M3T-F160-128NRD (optional) | |
| M16C/30 | M16C/30 | M30302 | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-FLX-100NSD (optional) | PC4701U |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-FLX-100NRB (optional) | |
| | M16C/30L | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) | |
| | M16C/30P | | 100 pin 0.5 mm pitch LQFP | PLQP0100KB-A | 100P6Q-A | M3T-F160-100NSD (optional) | PC7501 |
| | | | 100 pin 0.65 mm pitch QFP | PRQP0100JB-A | 100P6S-A | M3T-F160-100NRB (optional) | |
| M16C/10 | M16C/1N | M301N2 | 48 pin 0.5 mm pitch LQFP | PLQP0048KB-A | 48P6Q-A | M30102T-PTC (optional) | PC4701U |

*1 Various other useful accessory tool products are also available. For more information visit http://www.renesas.com/accessory
★★ Under development: product name may be changed.
(included): Included with emulation pod or probe.
(optional): Not included with emulation pod or probe. Purchase it separately.

## Operating Environment for M16C/60, 30, and 10 Series

| Product type | Product name | Host machine (OS) |
|---|---|---|
| RTOS | M3T-MR30/4 *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| C compiler package | M3T-NC30WA *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| MISRA C rule checker | SQMlint *3 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| IDE | High-performance Embedded Workshop *4 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Simulator debugger | Simulator Debugger for M16C and R8C/Tiny Series *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | PC7501 Emulator Debugger for M16C/60,30,10, M16C/Tiny and R8C/Tiny Series *6<br>PC4701 Emulator Debugger for M16C/60,30,10 and M16C/Tiny Series *6<br>Compact Emulator Debugger for M16C and R8C/Tiny Series *6<br>FoUSB/UART Debugger for M16C and R8C/Tiny Series *6<br>E8 Emulator Software *6 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Flash and PROM Programming | Flash Development Toolkit *7 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-MR30/4 is the generic name for real-time OS development kit (M3T-MR30/4K) and mass production contract (M3T-MR30/4S).
*2 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*4 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5 Simulator debugger is included with C compiler package.
*6 Emulator debugger is bundled with emulators.
*7 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.

## Development tools for M16C/Tiny Series

| MCU | | | Introductory tools | Software tools | | | Emulator (Emulator debugger is included. *6) | | | | Programming tool |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Group | MCU | Starter kit | RTOS | C compiler package | IDE | Onchip debugging emulator | Compact emulator | In-circuit emulator | | Programmer |
| | | | | | | | | | Emulator | Emulation pod | |
| M16C/Tiny | M16C/26A | M30260 | Renesas Starter Kit for M16C/26A (type name: R0K33026AS000BR) *1 | M3T-MR30/4 *2 | M3T-NC30WA *3 (MISRA C *4) | High-performance Embedded Workshop *5 | E8 *7 | M3028BT2-CPE *8 | PC7501 | M3028BT-EPB *9 | Flash Development Toolkit *10 (E8 emulator is necessary at programming) or M3A-0806 *11 or Programmers by partner vendors are also available |
| | | M30263 | | | | | | | | | |
| | M16C/28 | M30280 | Renesas Starter Kit for M16C/29 (type name: R0K330290S000BE) *1 | | | | | | | | |
| | | M30281 | | | | | | | | | |
| | M16C/29 | M30290 | | | | | | | | | |
| | | M30291 | | | | | | | | | |

*1 CPU board, Onchip debugging emulator E8, software (Integrated development environment High-performance Embedded Workshop, C compiler package M3T-NC30WA free evaluation version, E8 emulator debugger, Flash Development Toolkit free evaluation version) and others are included.
*2 M3T-MR30 is the generic name for real-time OS development kit (M3T-MR30K) and mass production contract (M3T-MR30S).
*3 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler, and simulator debugger.
*4 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*5 High-performance Embedded Workshop is included with C compiler package and emulator debugger.
*6 You can download the latest version from Web.
*7 E8 emulator includes software (High-performance Embedded Workshop, E8 emulator debugger, Evaluation version of C compiler package, Evaluation version of Flash Development Toolkit). Depending on the time of delivery, the bundled software you purchased may include the previous version.
*8 M3028BT2-CPE is the successor product of the M30290T2-CPE. It supports 24MHz operation of M16C/Tiny series MCUs. The conversion board for the target connection is necessary for M3028BT2-CPE.. The set sales of the emulator and the conversion board are also available. For details, please refer to the lists of "Set Package of Compact Emulator for M16C/Tiny Series" and "Converter Board for M16C/Tiny Series".
*9 M3028BT-EPB is the successor product of the M30290T-EPB. It supports 24MHz operation of M16C/Tiny series MCUs. The conversion board for the target connection is necessary for M3028BT-EPB. The set sales of the emulator and the conversion board are also available. For details, please refer to the lists of "Set Package of PC7501Emulation Probe for M16C/Tiny Series" and "Converter Board for M16C/Tiny Series".
*10 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.
*11 Cannot rewrite the data flash area.

## Set Package of Compact emulator for M16C/Tiny Series

| MCU | | Target MCU | | | Product name | Components *1 |
|---|---|---|---|---|---|---|
| Series | Group | Package type | Package name | Old package name | | |
| M16C/Tiny | M16C/26A (M30263) | 42 pin 0.8 mm pitch SSOP | PRSP0042GA-B | 42P2R-E | M3028BT2-CPE-1 | Compact emulator M3028BT2-CPE<br>Converter board M30263T-42SSB |
| | M16C/26A (M30260) | 48 pin 0.5 mm pitch LQFP | PLQP0048KB-A | 48P6Q-A | M3028BT2-CPE-2 | Compact emulator M3028BT2-CPE<br>Converter board M30260T-48FPD |
| | M16C/28 (M30281)<br>M16C/29 (M30291) | 64 pin 0.5 mm pitch LQFP | PLQP0064KB-A | 64P6Q-A | M3028BT2-CPE-3 | Compact emulator M3028BT2-CPE<br>Converter board M30291T-64FPD |
| | M16C/28 (M30280)<br>M16C/29 (M30290) | 80 pin 0.5 mm pitch LQFP | PLQP0080KB-A | 80P6Q-A | M3028BT2-CPE-4 | Compact emulator M3028BT2-CPE<br>Converter board M30290T-80FPD |
| | M16C/28 (M30280) | 85 pin 0.65 mm pitch TFLGA | PTLG0085JB-A | 85F0G | M3028BT2-CPE-5 | Compact emulator M3028BT2-CPE<br>Converter board M30280T-85LGF |

*1 Compact emulator and converter board are also sold separately.

### Set Package of PC7501Emulation probe for M16C/Tiny Series

| MCU | | Target MCU | | | Product name | Components *1 |
|---|---|---|---|---|---|---|
| Series | Group | Package type | Package name | Old package name | | |
| M16C/Tiny | M16C/26A (M30263) | 42 pin 0.8 mm pitch SSOP | PRSP0042GA-B | 42P2R-E | M3028BT-EPB-1 | Emulation probe M3028BT-EPB<br>Converter board M30263T-42SSB |
| | M16C/26A (M30260) | 48 pin 0.5 mm pitch LQFP | PLQP0048KB-A | 48P6Q-A | M3028BT-EPB-2 | Emulation probe M3028BT-EPB<br>Converter board M30260T-48FPD |
| | M16C/28 (M30281)<br>M16C/29 (M30291) | 64 pin 0.5 mm pitch LQFP | PLQP0064KB-A | 64P6Q-A | M3028BT-EPB-3 | Emulation probe M3028BT-EPB<br>Converter board M30291T-64FPD |
| | M16C/28 (M30280)<br>M16C/29 (M30290) | 80 pin 0.5 mm pitch LQFP | PLQP0080KB-A | 80P6Q-A | M3028BT-EPB-4 | Emulation probe M3028BT-EPB<br>Converter board M30290T-80FPD |
| | M16C/28 (M30280) | 85 pin 0.65 mm pitch TFLGA | PTLG0085JB-A | 85F0G | M3028BT-EPB-5 | Emulation probe M3028BT-EPB<br>Converter board M30280T-85LGF |

*1 Emulation probe and converter board are also sold separately.

### Converter Board for M16C/Tiny Series*1

| MCU | | Target MCU | | | Product name |
|---|---|---|---|---|---|
| Series | Group | Package type | Package name | Old package name | |
| M16C/Tiny | M16C/26A (M30263) | 42 pin 0.8 mm pitch SSOP | PRSP0042GA-B | 42P2R-E | M30263T-42SSB |
| | M16C/26A (M30260) | 48 pin 0.5 mm pitch LQFP | PLQP0048KB-A | 48P6Q-A | M30260T-48FPD |
| | M16C/28 (M30281)<br>M16C/29 (M30291) | 64 pin 0.5 mm pitch LQFP | PLQP0064KB-A | 64P6Q-A | M30291T-64FPD |
| | M16C/28 (M30280)<br>M16C/29 (M30290) | 80 pin 0.5 mm pitch LQFP | PLQP0080KB-A | 80P6Q-A | M30290T-80FPD |
| | M16C/28 (M30280) | 85 pin 0.65 mm pitch TFLGA | PTLG0085JB-A | 85F0G | M30280T-85LGF |

*1 Various other useful accessory tool products are also available.

### Operating Environment for M16C/Tiny Series

| Product type | Product name | Host machine (OS) |
|---|---|---|
| RTOS | M3T-MR30/4 *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| C compiler package | M3T-NC30WA *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| MISRA C rule checker | SQMlint *3 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| IDE | High-performance Embedded Workshop *4 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Simulator debugger | Simulator Debugger for M16C and R8C/Tiny Series *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | PC7501 Emulator Debugger for M16C/60,30,10, M16C/Tiny and R8C/Tiny Series *6<br>Compact Emulator Debugger for M16C and R8C/Tiny Series *6<br>E8 Emulator Software *6 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Flash and PROM Programming | Flash Development Toolkit *7 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-MR30/4 is the generic name for real-time OS development kit (M3T-MR30/4K) and mass production contract (M3T-MR30/4S).
*2 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*4 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5 Simulator debugger is included with C compiler package.
*6 Emulator debugger is bundled with emulators.
*7 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.

### Development tools for R8C/Tiny Series

| MCU | | Introductory tools | Software tools | | Emulator (Emulator debugger is included) | | | | Programming tool |
|---|---|---|---|---|---|---|---|---|---|
| Series | Group | Starter kit *1 | C compiler package | IDE | Onchip debugging emulator | Compact emulator | In-circuit emulator | | Programmer |
| | | | | | | | Emulator | Emulation pod | |
| R8C/Tiny | R8C/20** | Renesas Starter Kit for R8C/23 (type name: R0K521237S000BE)** | Product version of M3T-NC30WA *2 or Evaluation version of M3T-NC30WA *3 (MISRA C *4) | High-performance Embedded Workshop *5 | E8 *6 (ROM 32K/48K available) | R0E521000CPE00 *7 | PC7501 | R0E521000EPB00 *8 | Flash Development Toolkit *9 (E8 emulator is necessary at programming) or M16C Flash Starter M3A-0806 *10** |
| | R8C/21** | | | | | | | | |
| | R8C/22** | | | | | | | | |
| | R8C/23** | | | | | | | | |
| | R8C/28** | Renesas Starter Kit for R8C/27 (type name: R0K521276S000BE)** | Product version of M3T-NC30WA *2 or Evaluation version of M3T-NC30WA *3 (MISRA C *4) | | E8 *5** | | | | Flash Development Toolkit *9** (E8 emulator is necessary at programming) |
| | R8C/29** | | | | | | | | |

*1 CPU board, On-chip debugging emulator E8, software (High-performance Embedded Workshop, E8 emulator debugger, Evaluation version of C compiler package M3T-NC30WA, Evaluation version of Flash Development Toolkit) are included with Starter Kit. Depending on the time of delivery, the bundled software you purchased may include the previous version. The latest version can be downloaded in Renesas Web (free of charge). http://www.renesas.com/tool_download
*2 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3 Evaluation version of M3T-NC30WA includes integrated development environment, C compiler, assembler and simulator debugger. Evaluation version compiler can be downloaded from Renesas web site (free of charge). Note that evaluation version compiler is functionally equivalent to professional version for 60 days after it is installed, but after the lapse of this period its use is limited to 64KB. Technical support and upgrade service are not provided.
*4 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions.
*5 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*6 E8 (type name:R0E000080KCE00) emulator includes software (High-performance Embedded Workshop, E8 emulator debugger, Evaluation version of C compiler package M3T-NC30WA, Evaluation version of Flash Development Toolkit). Depending on the time of delivery, the bundled software you purchased may include the previous version. The latest version can be downloaded in Renesas Web (free of charge). http://www.renesas.com/tool_download
*7 The conversion board for the target connection is necessary for R0E521000CPE00. The set sales of the emulator and the conversion board are also available. For details, please refer to the lists of "Set Package of Compact Emulator for R8C/Tiny Series".
*8 The conversion board for the target connection is necessary for R0E521000EPB00. The set sales of the emulator and the conversion board are also available. For details, please refer to the lists of "Set Package of PC7501 Emulation Probe for R8C/Tiny Series".
*9 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.
*10 Flash Programmer which supports standard serial I/O mode 2 (UART) and includes the M16C Flash Starter Software (for Windows).
*11 IC socket board is a programming adaptor board which corresponds to the programmer.
** Under development or evaluation: product name may be changed. When MCU is under development, restrictions and other limitation for tools may be arisen.

### Set Package of Compact Emulator for R8C/Tiny Series

| Target MCU | | Product name | Components (Compact emulator and converter board are also sold separately.) | |
|---|---|---|---|---|
| Group | Package name | | Compact emulator | Converter board *1 |
| R8C/20**<br>R8C/21**<br>R8C/22**<br>R8C/23** | PLQP0048KB-A<br>*Previous code : 48P6Q-A<br>(48-pin 0.5mm-pitch LQFP) | R0E521237CPE00 | R0E521000CPE00 | R0E521237CFK00 |
| R8C/28**<br>R8C/29** | PLSP0020JB-A<br>*Previous code : 20P2F-A<br>(20-pin 0.65mm-pitch LSSOP) | R0E521174CPE00 | | R0E521174CSJ00 |

*1 Converter board, socket for user system connection and user's manual are included.
★★ Under development

### Set Package of PC7501 Emulation Probe for R8C/Tiny Series

| Target MCU | | Product name | Components (Compact emulator and converter board are also sold separately.) | |
|---|---|---|---|---|
| Group | Package name | | Emulation probe | Converter board *1 |
| R8C/20**<br>R8C/21**<br>R8C/22**<br>R8C/23** | PLQP0048KB-A<br>*Previous code : 48P6Q-A<br>(48-pin 0.5mm-pitch LQFP) | R0E521237EPB00 | R0E521000EPB00 | R0E521237CFK00 |
| R8C/28**<br>R8C/29** | PLSP0020JB-A<br>*Previous code : 20P2F-A<br>(20-pin 0.65mm-pitch LSSOP) | R0E521174EPB00 | | R0E521174CSJ00 |

*1 *1. Converter board, socket for user system connection and user's manual are included.
★★ Under development

### Operating Environment for R8C/Tiny Series

| Product type | Product name | Host machine (OS) |
|---|---|---|
| C compiler package | M3T-NC30WA *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| MISRA C rule checker | SQMlint *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| IDE | High-performance Embedded Workshop *3 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Simulator debugger | Simulator Debugger for M16C and R8C/Tiny Series *4 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | PC7501 Emulator Debugger for M16C/60,30,10, M16C/Tiny and R8C/Tiny Series *5<br>Compact Emulator Debugger for M16C and R8C/Tiny Series *5<br>E8 Emulator Software *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Flash and PROM Programming | Flash Development Toolkit *6 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-NC30WA includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*2 MISRA C rule checker SQMlint (type name: R0C00000SCW01R) is an optional product for the Renesas C compiler.
*3 High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*4 Simulator debugger is included with C compiler package.
*5 Emulator debugger is bundled with emulators.
*6 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.

### Development tools for H8SX family

| MCU | | | Software tools | | | | Hardware tools | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Low-cost model *3 | High-end model *3 | | |
| Series | Group | Type name | RTOS (µITRON) | C/C++ compiler package | Simulator debugger | IDE | Emulator *4 | Emulator | Host interface board | User cable or User system interface board |
| H8SX/1500 | H8SX/1520R | H8SX/1527R** | (HI1000/4)<br>R0R41600TRW01w *1 | C/C++ Compiler Package or H8SX, H8S, H8 Family (MISRA C *2) | | | (E10A-USB)<br>HS0005KCU01H/02H* | (E6000H)<br>HS1527REPH60H *5 | HS6000EIP02H *6<br>(PC-Card)<br>or HS6000EIC02H<br>(PCI-Card)<br>or HS6000ELN01H<br>(LAN-Adapter)<br>or HS6000EIU02H<br>(USB-Adapter) | HS1527ECH61H<br>(FP-100M) |
| | H8SX/1544 | H8SX/1543**<br>H8SX/1544** | | | | | | (E6000H)<br>HS1544EPH60H* | | HS1544ECH61H<br>(FP-144L)* |

*1 w="1": Evaluation contract, one host machine
w="5": Evaluation contract, up to 5 host machines
w="A": Evaluation contract, up to 10 host machines
w="K": Mass production contract, up to 1000 user systems
w="U": Mass production contract, no limit on the number of user systems w="Z": Mass production contract, no limit on the number of user systems, with kernel source code
Different type names may be used in some regions. In this case, please ask your local Renesas office about the ordering number.
*2 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions to the Renesas C compiler (V.6.01 Release 00 or greater).
*3 Emulator software is bundled with emulator.
*4 HS0005KCU01H uses only H-UDI function of MCU. HS0005KCU02H uses H-UDI function and AUD function of MCU.
Only flash memory version is supported. Cannot use ROM-less mode.
*5 Set package with HS6000EIU02H (USB-Adapter) is also available. As for the set package name, "-U" is added to the end of the type name of emulator. e.g. HS1650EPH60H-U
*6 The previous product HS6000EIP01H(PC-Card) is available as well.
★ New MCU
★★ Under development

### Product type names of license tools for adding device groups for emulator E10A-USB

| Target device | | License tool |
|---|---|---|
| H8SX/1525F<br>H8SX/1527F<br>H8SX/1527RF*<br>H8SX/1582F<br>H8SX/1653F<br>H8SX/1651 | H8SX/1654F<br>H8SX/1663F<br>H8SX/1664F<br>H8SX/1543F*<br>H8SX/1544F* | HS1527KCU01SR |

★ New MCU

## Development tools for H8S family

| MCU | | Software tools | | | | Hardware tools | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Low-cost model *3 | High-end model *3 | | | |
| Series | Group | RTOS (µITRON) | C/C++ compiler package | Simulator debugger | IDE | Emulator *4 | Emulator | Host interface board | User cable or User system interface board | Option |
| H8S/2500 | H8S/2556 | (HI1000/4) R0R41600TRW01w *1 | C/C++ Compiler Package for H8SX, H8S, H8 Family (MISRA C *2) | | | – | (E6000) HS2556EPI62H *5 | HS6000EIP02H *8 (PC-Card) or HS6000EIC02H (PCI-Card) or HS6000ELN01H (LAN-Adapter) or HS6000EIU02H (USB-Adapter) | HS2556ECH61H (FP-144J) | HS6000EMS12H (4MB) (Expansion memory) |
| | H8S/2552 | | | | | | | | HS2556ECH61H (FP-144J) or HS2552ECB62H (BP-176V) | |
| | H8S/2506 | | | | | | | | | |
| H8S/2300 | H8S/2319 | | | | | (E10A-USB) HS0005KCU01H/02H Only H8S/2319EF is supported | (E6000) HS2339EPI61H | | HS2318ECH61H (FP/TFP-100B) | |
| H8S/2200 | H8S/2282 | | | | | – | (E6000) HS2646EPI61H *6 | | HS2282ECF61H (FP-100A) | |
| | H8S/2258 (when using IE Bus™) | | | | | | (E6000) HS2633REPI61H *7 + HS2258EIO61H | | HS2258ECF61H (FP-100A) or HS2258ECH61H (FP/TFP-100B) | |
| | H8S/2258 (when not using IE Bus™) | | | | | | (E6000) HS2633REPI61H *7 | | HS2238ECF61H (FP-100A) or HS2238ECH61H (FP/TFP-100B) | |
| H8S/2100 | H8S/2148 | | | | | | (E6000) HS2140EPI61H | | HS2148ECH61H (FP/TFP-100B) | |

*1 w="1": Evaluation contract, one host machine
w="5": Evaluation contract, up to 5 host machines
w="A": Evaluation contract, up to 10 host machines
w="K": Mass production contract, up to 1000 user systems
w="U": Mass production contract, no limit on the number of user systems
w="Z": Mass production contract, no limit on the number of user systems, with kernel source code
Different type names may be used in some regions. In this case, please ask your local Renesas office about the ordering number.
*2 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions to the Renesas C compiler (V.6.01 Release 00 or greater).
*3 Emulator software is bundled with emulator.
*4 HS0005KCU01H uses only H-UDI function of MCU. HS0005KCU02H uses H-UDI function and AUD function of MCU.
Only flash memory version is supported. Cannot use ROM-less mode.
H8S/2319 Group supports H8S/2319EF.
*5 P1Vcc and P2Vcc can be used in another power supply in HS2556EPI62H. They can be used only as the same power supply in HS2556EPI61H.
*6 This emulator does not provide the pulse function. 32.768kHz are always selected as a sub-clock.
*7 Set package with HS6000EIU02H (USB-Adapter) is also available. As for the set package name, "-U" is added to the end of the type name of emulator. e.g. HS2633REPI61H-U
*8 The previous product HS6000EIP01H is available as well.

## Product type names of license tools for adding device groups for emulator E10A-USB

| Target device | License tool |
|---|---|
| 2212F, 2212UF, 2218F, 2218UF, 2377F, 2377RF, 2378F, 2378RF, 2367F, 2368F, 2168F, 2167F, 2166F, 2437F, 2114F, 2339EF, 2329EF, 2319EF, 2170F, 2171F, 2172F, 2189RF, 2116F*, 2215RF*, 2215RVF*, 2215TF*, 2215TVF*, R8J32500*, R8J32700C* | HS2339KCU01SR |

★ New MCU

## Development tools for H8 family

| MCU | | Software tools | Hardware tools | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Low-cost model *3 | Compact Emulator *5 | | High-end model *3 | | | |
| Series | Group | C/C++ compiler package *1 | Onchip debugging emulator *4 | Emulator | Converter board | In-circuit emulator | Host interface board | User cable or User system interface board | Option |
| H8/300H | H8/3039 | C/C++ Compiler Package for H8SX, H8S, H8 Family (MISRA C *2) | – | – | – | (E6000) HS3052EPI61H | HS6000EIP02H *6 (PC-Card) or HS6000EIC02H (PCI-Card) or HS6000ELN01H (LAN-Adapter) or HS6000EIU02H (USB-Adapter) | HS3039ECH61H (FP-80A) or HS3039ECN61H (TFP-80C) | HS6000EMS12H (4MB) (Expansion memory) |
| H8/300H Tiny | H8/36087 | | (E8) R0E000080KCE00 | – | – | (E6000 with USB I/F) HS3664EPI62H | HS6000EIP02H *6 (PC-Card) or HS6000EIC02H (PCI-Card) or HS6000ELN01H (LAN-Adapter) | HS3687ECH61H (FP-64E) or HS3687ECH62H(FP-64A) | – |
| | H8/36049 | | | R0E436640CPE00 | R0E436049CFJ10 (FP-80A) | (E6000 with USB I/F) HS3664EPI62H + HS36024EIO61H | | HS36049ECH61H(FP-80A) | |
| | H8/3687 | | | | R0E436640CFK20 (FP-64E) or R0E436640CFG20 (FP-64A) | (E6000 with USB I/F) HS3664EPI62H | | HS3687ECH61H(FP-64E,K) or HS3687ECH62H(FP-64A) | |

*1 This product includes integrated development environment (High-performance Embedded Workshop) and simulator debugger.
*2 Installation of an optional product MISRA C rule checker SQMlint (type name: R0C00000SCW01R) adds MISRA C rule inspection functions to the Renesas C compiler (V.6.01 Release 00 or greater).
*3 Emulator software is bundled with emulator.
*4 Only flash memory version supported. Cannot use ROM-less mode.
*5 The conversion board for the target connection is necessary. The set sales of the emulator and the conversion board are also available. For details, please refer to the lists of "Set Package of Compact Emulator for H8/300H Tiny Series".
*6 The previous product HS6000EIP01H (PC-Card) is available as well.

### Set Package of Compact emulator for H8/300H Tiny Series

| Product type name | Components | | Package type | Package name | Old package name |
|---|---|---|---|---|---|
| | Compact emulator | Converter board | | | |
| R0E436640CPE10 | R0E436640CPE00 | R0E436640CFG20 | 64 pin 0.8 mm pitch QFP | PRQP0064GB-A | FP-64A |
| R0E436640CPE20 | | R0E436640CFK20 | 64 pin 0.5 mm pitch LQFP | PLQP0064KC-A | FP-64E |
| R0E436049CPE10 | | R0E436049CFJ10 | 80 pin 0.65 mm pitch QFP | PRQP0080JB-A | FP-80A |

### Development tools for 740 Family

| MCU | Software tools | | Hardware tools | | | | | Programming tool |
|---|---|---|---|---|---|---|---|---|
| Group | Assembler C compiler | IDE | Compact emulator | Emulator MCU | Target connection | | | Flash programmer |
| | | | | | Package type | Package name (Previous code) | Recommended accessories *6 | |
| 7542 | C compiler package M3T-ICC740 *1 or Assembler package M3T-SRA74 *2 | High-performance Embedded Workshop *3 | M38000T2-CPE *4 *5 | M37542RSS | 32 pin 0.8 mm pitch LQFP | PLQP0032GB-A (32P6U-A) | M37530T-PTC (optional) + M37530T-PTCB (optional) | Flash Development Toolkit *7 (E8 emulator is necessary at programming.) or M3A-0665, M3A-0806 |
| | | | | | 32 pin 1.778 mm pitch SDIP | PRDP0032BA-A (32P4B) | M37530T-PTCC (optional) + SDIP socket (optional) | |
| | | | | | 36 pin 0.8 mm pitch SSOP | PRSP0036GA-A (36P2R-A) | M37530T-PTC (optional) + M3T-SSOP36B-450 (optional) | |
| | | | | | 36 pin 0. 5mm pitch LCC | PWQN0036KA-A (36PJW-A) | – | |

*1 M3T-ICC740 is a package including IAR systems C compiler ICC740 for 740 Family. It also includes Renesas simulator debugger and IDE.
*2 M3T-SRA74 includes integrated development environment, assembler and simulator debugger.
*3 High-performance Embedded Workshop is included with C compiler package and assembler package.
*4 Compact emulator M38000T2-CPE includes software (High-performance Embedded Workshop, emulator debugger, Evaluation version of C compiler). Depending on the time of delivery, the bundled software you purchased may include the previous version. The latest version can be downloaded in Renesas Web (free of charge). http://www.renesas.com/tool_download
*5 Can be debugged with PC4701U emulator and emulation pod M38000TL2-FPD.
*6 Various other useful accessory tool products are also available.
For details, refer to Renesas website (http://www.renesas.com/accessory).
*7 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support) . The E8 emulator (type name R0E000080KCE00) is necessary at the programming.
(optional): Not included with emulation pod or probe. Purchase it separately.

### Operating environment for 740 Family

| Product type | Product name | Host machine (OS) |
|---|---|---|
| C compiler package | M3T-ICC740 *1 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| Assembler package | M3T-SRA74 *2 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |
| Simulator debugger | 740 Simulator Debugger *3 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| IDE | High-performance Embedded Workshop *4 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Emulator debugger | 740 Compact Emulator debugger (M38000T2-CPE) *5 | IBM PC/AT compatibles (Windows® XP, Me, 98SE, 2000) |
| Flash and PROM Programming | Flash Development Toolkit *6 | IBM PC/AT compatibles (Windows® XP, Me, 98, 2000, NT® 4.0) |

*1 M3T-ICC740 is a package including IAR systems C compiler ICC740 for 740 Family. It also includes Renesas simulator debugger and IDE.
*2 M3T-SRA74 includes integrated development environment, assembler and simulator debugger.
*3 Simulator debugger is included with C compiler package and assembler package.
*4 High-performance Embedded Workshop is included with C compiler package and assembler package.
*5 Emulator debugger is bundled with emulator.
*6 There are two kinds of Flash Development Toolkit (type name HS6400FDIW3SR): product version (with technical support) and free evaluation version (w/o technical support).
The E8 emulator (type name R0E000080KCE00) is necessary at the programming.

## Coding Tools

### Embedded Development Environment codellab EDE

**Accelerated Technology, Embedded Systems Division of Mentor Graphics**

TEL: +1-251-661-5770
E-mail: info@acceleratedtechnology.com
http://www.mentor.com/embedded/

### Renesas M16C Software Development Tool, Renesas R8C/Tiny Software Development Tool

**Altium Limited**

TEL: +61 2 9975 7710
E-mail: info@altium.com
http://www.altium.com/tasking/

### MATLAB Product Family

**Cybernet Systems Co., Ltd.**

TEL: +81-3-5978-5410
E-mail: infomatlab@cybernet.co.jp
http://www.cybernet.co.jp/MATLAB/

### Production Code Generation Software TargetLink

**dSPACE GmbH**

TEL: +49 5251 1638-0
E-mail: info@dspace.de
http://www.dspace.de/

### IDE for embedded real-time systems OPENplus

**Gaio Technology, Inc.**

TEL: +1-800-293-9053
Email: info@gaio.com
http://www.gaio.com/

### IAR Embedded Workbench®, visualSTATE®

**IAR Systems Inc.**

TEL: +1 650 287-4250
E-mail: info@iar.com
http://www.iar.com/

### KPIT GNU Tools

**KPIT Infosystems Limited**

TEL: 44 118 951 9400
E-mail: kpituk@kpitcummins.com
http://www.kpitgnutools.com/

### Red Hat® GNUPro®

**Red Hat, Inc.**

1-888-REDHAT1 (1-888-733-4281)
http://www.redhat.com/

### IAR EWM32C, IAR EWM16C, IAR EWH8

**SEGGER Microcontroller Systeme GmbH**

TEL: +49 (0) 2103-2878-0
E-mail: info@segger.com
http://www.segger.com/

### Integrated Development Environment microVIEW-STUDIO

**Yokogawa Digital Computer Corporation**

TEL: +81-42-333-6226
E-mail: info-sft@sft.ydc.co.jp
http://www.advice-plus.com/

## OS

### Real Time Operating System Nucleus PLUS, Nucleus µiPLUS

**Accelerated Technology, Embedded Systems Division of Mentor Graphics**

TEL: +1-251-661-5770
E-mail: info@acceleratedtechnology.com
http://www.mentor.com/embedded/

### CMX-RTX

**Altium Ltd.**

TEL: +61 2 9975 7710
E-mail: info@altium.com
http://www.tasking.com/cmx/rtos/

### Real-time OS CMX-RTX

**CMX Systems, Inc.**

TEL: +1 904-880-1840
Email: cmx@cmx.com
http://www.cmx.com/

### OSE Epsilon RTOS

**Enea Embedded Technology**

TEL: +46 (0)8 507-140-00
Email: info@enea.se
http://www.enea.com/

### RTA-OSEK

**ETAS Group**

TEL: +44 1904 562580
E-mail: info@livedevices.com
http://en.etasgroup.com/products/rta/index.shtml

### RTOS compliant with OSEK SB2 PrOSEK

**eSOL Co., Ltd.**

TEL: +81-3-5301-5325
E-mail: ep-info@esol.co.jp
http://www.esol.co.jp/english/embedded/

### ThreadX

**Express Logic. Inc.**

TEL: 1-858-613-6640
E-mail: info@expresslogic.com
http://www.expresslogic.com/

### Real-time OS embOS

**SEGGER Microcontroller Systeme GmbH**

TEL: +49 (0) 2103-2878-0
E-mail: info@segger.com
http://www.segger.com/

### Multitasking real-time operating system osCAN
### Tool for simulation and testing of networks and electronic control units CANoe

**Vector Infomatik GmbH**

TEL: +49 711 80670-0
E-mail: info@vector-infomatik.de
http://www.vector-informatik.de/

### OSEKWorks, pSOSystem/pRISM+

**Wind River Systems, Inc.**

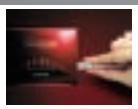
TEL: +1-510-748-4100 (800-545-9463)
Email: inquiries@windriver.com
http://www.windriver.com/

For more information on partner products, visit
http://www.renesas.com/partners

## Emulation and Debugging

### PALMiCE2, NEXTiCE (TADP model)

**Computex Co., Ltd.**
TEL: +81-3-3253-2901
E-mail: sales@computex.co.jp



### Power Tools - Power Trace II

**Lauterbach Datentechnik**
TEL: +49 8104 8943 0
E-mail: info_de@lauterbach.com
http://www.lauterbach.com/

### Emulator UniSTAC/J, HyperSTAC, MultiSTAC

**Sophia Systems Co., Ltd.**
TEL: +81 44 989 7110
E-mail: sales@sophia.com
http://www.sophia.com/

### Compact emulators S30830T-CPE, S3062PT-CPE

**Sunny Giken Inc.**
Email: support_apl@renesas.com
(Renesas Solutions Corp.)
http://www.sunnygiken.co.jp/english/

### Emulator advicePLUS, advicePOCKET

**Yokogawa Digital Computer Corporation**
TEL: +81-42-333-6222
E-mail: info-ovs@yokogawa-digital.com
http://www.yokogawa-digital.com/en/

## Flash and PROM Programming

### Programmers AF9708, AF9709B, AF9723

**Flash Support Group, Inc.**
TEL: +81-53-428-8380
E-mail: support@j-fsg.co.jp
http://www.j-fsg.co.jp/

### FlashPAK, PS288/PS300, RoadRunner

**Data I/O Corporation**
TEL: +1-425-867-6893
E-mail: rodgerb@data-io.com
http://www.dataio.com

### Universal Programmer ALL-11

**HI-LO SYSTEM RESEARCH CO., LTD.**
TEL: +886-2-8792-3301
E-mail: sales@hilosystems.com.tw
http://www.hilosystems.com.tw/

### SU3000 Gang-8 programmer

**Leap Electronic Co., LTD.**
TEL: 886 2 2999-1860
E-mail: service@leap.com.tw
http://www.leap.com.tw

### Model 1894

**Minato Electronics Inc.**
TEL: +81-45-592-5549
E-mail: h_kinoshita@minato.co.jp
http://www.minato.co.jp/index_e.asp

### Programming tool for Renesas flash microcontrollers with on-chip flash Flasher 4

**SEGGER Microcontroller Systeme GmbH**
TEL: +49-(0)2103-2878-0
E-mail: info@segger.com
http://www.segger.com/

### Flash Memory Programmer MSP-II

**Suisei Electronics System Co., Ltd.**
TEL: +81-6-6913-4531
E-mail: support@suisei.co.jp
http://www.suisei.co.jp/index_e.htm

### Flash Microcomputer Programmer S550-MFW1U, S550-SFW1U

**Sunny Giken Inc.**
Email: support_apl@renesas.com
(Renesas Solutions Corp.)
http://www.sunnygiken.co.jp/english/

### T9600

**System General Corp.**
TEL: +1-408-263-6667
E-mail: sales@systemgeneral.com
http://www.systemgeneral.com/

### CANfbl

**Vector Infomatik GmbH**
TEL: +49 711 80670-0
E-mail: info@vector-infomatik.de
http://www.vector-informatik.de/

### Flash programming and testing system Y1000-8T

**Wave Technology Co., Ltd.**
TEL:+81-3-5304-1885
E-mail: sales@y1000.com
http://www.y1000.com/index_e.html

### Universal Flash Microcomputer Programmer NET IMPRESS, MegaNETIMPRESS, C''arNETIMPRESS

**Yokogawa Digital Computer Corporation**
TEL: +81-42-333-6224
E-mail: info-impress@yokogawa-digital.com
http://www.yokogawa-digital.com/en

## CAN Tools

### C”arNET IMPRESS

[Product code]
**AF620**

CAN programmer for in-vehicle electric units
- Includes the CAN interface as standard equipment
- Regardless of microcomputers, you can use the same CAN flash programming environment.
- High-speed programming of IMB/60s.

[Components]
- NET IMPRESS main body
- Manual

**Yokogawa Digital Computer Corp.**
E-mail: info-impress@yokogawa-digital.com
http://www.yokogawa-digital.com/emb/en/index.html

### CANscope

Oscilloscope for measurement and display of CAN busline voltage.
- When used along with CANdb, it also can analyze signals propagating on CAN buses.
- Designed for use with high/low-speed single-wire CAN.
- Can make measurement stand-alone and analyze the measured data on a PC at a later time.

[Components]
- CAN scope main body
- CAN scope recording module
- CAN scope evaluation software for MS Windows 98/NT/2000/XP
- USB-RS232C conversion adaptor
- Cable set
- Power supply

### CANalyzer

This tool allows you to monitor and analyze CAN communications.
- Capable of single-node simulation thanks to its message transmit/receive function.
- Options for expansion to LIN, MOST or FlexRay networks available.
- Optionally supports the CAN upper layer (J1939, CANopen, DeviceNET)

[Components]
- CANalyzer main body (Software only)

### CANoe

Development tool that can monitor and analyze CAN communications, and enables algorithm design, evaluation (simulation) and tests.
- Provides visually improved simulation based on the GUI environment
- Includes greatly extended ECU diagnosis and testing functions.
- Optionally extends to LIN, MOST and FlexRay networks.

[Components]
- CANoe main body (Software only)

### CANape

Development tool that has functions including measurement of ECU data, writing to calibration and its flash memory, measurement of analog signal or CAN, and calibration.
- Applicable microcontrollers
  SuperH family (SH1, SH2), H8S family, M32R/ECU series, M16C family

[Components]
- CANape main body (Software only)

[Europe, Asia (except Japan)]
**Vector Informatik GmbH**
E-mail: info@vector-informatik.de
http://www.vector-informatik.de/

[U.S.]
**Vector CANtech Inc.,**
E-mail: info@vector-cantech.com
http://www.vector-cantech.com

[Japan]
**Vector Japan**
E-mail: Tool@vector-japan.co.jp
http://www.vector-japan.co.jp

### CANbedded

Embedded software components for automobile ECU communications-based network using CAN protocol
- Supports communications specifications determined by large number of automobile manufacturers
- Provides database compatible with Vector simulation and measurement tool
- Comes with a source code generator.
- Comes with a sample program.
- Supports the C language.
- Applicable microcontrollers
  SuperH family, H8S and H8SX families, H8/300H Tiny series, M32R/ECU series and M16C family.

### osCAN

OSEK/VDX 2.2 compliant real-time multitasking operating system.
- Comes with the OIL configurator.
- Comes with a sample program.
- Supports the C language.
- Provides a simulation environment based on the Vector simulation tool.
- Uses modeling tools (UML, SDL) of various companies to assist engineers.
- Applicable microcontrollers
  SuperH family, H8S family, H8/300H Tiny series, M32R/ECU series, M16C family and 7600 series.

### tresos with OSEK plug-in

tresos is an open configuration and generation environment for embedded standard software. It can be extended by various plug-ins.The OSEK plug-in supports the configuration and generation of an OSEK operating system.
- OSEK/VDX-OS 2.2.2 conforming real-time operating system
- Import/export of OIL 2.5 configurations
- Supports configurations split into various OIL files for improved work in teams
- Extensive checks for completeness and consistency at configuration time
- Optimized operating system kernel generated as C code
- Applicable microcontrollers
  SuperH family, H8S family, M32C/80 series

**3SOFT GmbH**
E-mail: info@3SOFT.de
http://www.3SOFT.de

## LIN Tools

| | | |
|---|---|---|
| DENalyzer | This tool allows you to monitor and analyze LIN networks in real time.<br>• Capable of single-node simulation thanks to its message transmit/receive function.<br>• Capable of master and slave simulation.<br>• Options for expansion to CAN, LIN or FlexRay networks available. | [Europe, Asia (except Japan)]<br>**Vector Informatik GmbH**<br>E-mail: info@vector-informatik.de<br>http://www.vector-informatik.de/<br><br>[U.S.]<br>**Vector CANtech Inc.,**<br>E-mail: info@vector-cantech.com<br>http://www.vector-cantech.com<br><br>[Japan]<br>**Vector Japan**<br>E-mail: Tool@vector-japan.co.jp<br>http://www.vector-japan.co.jp |
| DENoe | Development tool that can monitor and analyze LIN communications, and enables algorithm design, evaluation (simulation) and tests.<br>• Provides visually improved simulation based on the GUI environment<br>• Includes greatly extended ECU diagnosis and testing functions.<br>• Optionally extends to LIN, MOST and FlexRay networks. | |
| LIN driver | Software library for performing LIN master and slave communication.<br>• Compatible with LIN APIs.<br>• Comes with a source code generator.<br>• Comes with a sample program.<br>• Supports the C language.<br>• Applicable microcontrollers<br>Master library: H8S family, H8/300H Tiny series, M16C/1N and 6N groups<br>Slave library: H8/300H Tiny series | |

| | | |
|---|---|---|
| tresos with LIN plug-in | tresos is an open configuration and generation environment for embedded standard software. It can be extended by various plug-ins.The LIN plug-in supports the configuration of a software driver for LIN master and slave communication.<br>• Compatible with LIN 1.3 and LIN 2.0<br>• Compatible with entire LIN API and LIN diagnostic transport layer<br>• Delivered as C source code<br>• Generates efficient application<br>• Specific C code<br>• Comes with demo application<br>• Hardware abstraction Layer facilitates rapid port to other architectures<br>• Applicable microcontrollers<br>Master and slave node driver: M16C/60 series, M32C/80 series | **3SOFT GmbH**<br>E-mail: info@3SOFT.de<br>http://www.3SOFT.de |

## FlexRay Tools

### DECOMSYS::DESIGNER PRO

Support tool for FlexRay system design, scheduling design, parameter setting and other procedures
- Setting the scheduling function
- Creating a configuration file
- Analyzing offline timing
- Using a code generator
- Creating the OSEK task table (OIL)
- Customers can select versions from “FULL,” “ECU” and “LIGHT” according to the development phase.
- The tool can follow the AUTOSAR system design procedure.

[Components]
- CD-ROM (software program and manual)

### DECOMSYS::SIMTOOLS

MATLAB/Simulink based modeling and simulating tool

[Components]
- CD-ROM (software program and manual)

### DECOMSYS::COMMSTACK

FlexRay device driver software
- Including demo applications
- Supporting the FPGA environment for the M32C/85+ Renesas FlexRay communications controller. The tool will support the R32C series in the future.

[Components]
- CD-ROM (software program and manual)

### DECOMSYS::BUSDOCTOR

FlexRay bus analyzer
- Logging and analyzing FlexRay bus data
- Sending data (such as symbols, normal and error frames) to FlexRay bus
- Detecting protocol error
- Providing FlexRay, CAN, ADI-channel interfaces

[Components]
- Main body
- FlexRay cables (for 2 channels)
- CAN cables (2 channels)
- Trigger cable
- AC power supply
- PC connection cable
- CD-ROM (BUSDOCTOR<VISION> Analysis program and manual)

### DECOMSYS::NODE <RENESAS>

FlexRay evaluation board
- Including FPGA for the M32C/85+ Renesas FlexRay communications controller. This product will support R32C series in the future
- Providing interfaces for FlexRay, two CANs, UART, two analog outputs, eight analog inputs, 24 digital inputs/outputs, watchdog timer and debug connector

[Components]
- Main body
- Various cables
- AC power supply
- PC connection cables
- CD-ROM (manual, sample programs, circuit diagram, COMMSTACK API guide)

**DECOMSYS**
http://www.decomsys.com/

### TimeCore™

OSEKtime based real-time OS and FlexRay communications software

[Components]
- CD-ROM (real-time OS program, drivers, design guideline, demo applications, build environment)

**3SOFT GmbH**
E-mail: info@3SOFT.de
http://www.3SOFT.de

### FlexRayStress

Tool for testing FlexRay network ECU operation if there is physical damage to FlexRay network. The user can select from the following modes:
- Scope mode, which enables trigger output to oscilloscope and other instruments.
- Analog mode, which enables change of circuit parameters, short circuits (to power source, to earth), bit string transmission and other conditions
- Digital coupler mode (failure at protocol bit level)

[Components]
- FlexRayStress main body (hardware)
- Software for setting

### FlexCard

PC interface for connecting to FlexRay network
- Supporting CardBus
- Supporting protocol version 2.1
- Synchronizing time with Vector product and other interfaces
- Supporting StartUp/Sync node
- Monitoring during network startup (Renesas will release interfaces for USB, PCI and other specifications in the future.)

[Components]
- FlexCard main body (hardware)
- Drivers for Windows

[Europe, Asia (except Japan)]
**Vector Informatik GmbH**
E-mail: info@vector-informatik.de
http://www.vector-informatik.de/

[U.S.]
**Vector CANtech Inc.,**
E-mail: info@vector-cantech.com
http://www.vector-cantech.com

[Japan]
**Vector Japan**
E-mail: Tool@vector-japan.co.jp
http://www.vector-japan.co.jp

## DaVinci Network Designer. FlexRay

Integrated tool for FlexRay network design
- Setting clusters
- Setting FlexRay configuration parameters
- Setting static/dynamic schedule
- Supporting FIBEX V1.1.5 and V1.2
- Supporting cycle multiplex frames

[Components]
- DaVinci Network Designer FlexRay program (software)

## DENalyzer. FlexRay

Tool that can monitor and analyze FlexRay communications.
- Employs almost the same GUI operating method as CANalyzer
- Supports the CAPL function for FlexRay
- Optionally extends to CAN, LIN and MOST networks
- Supports FIBEX V1.1.5 and V1.2

[Components]
- DENalyzer FlexRay program (software)

## DENoe. FlexRay

Development tool that can monitor and analyze FlexRay communications, and enables algorithm design, evaluation (simulation) and tests.
- Providing visually improved simulation based on the GUI environment
- Optionally extending to CAN, LIN and MOST networks
- Supporting FIBEX V1.1.5 and V1.2

[Components]
- DENoe FlexRay program (software)

[Europe, Asia (except Japan)]
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[Japan]
**Vector Japan**
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http://www.vector-japan.co.jp

## FlexRay AnalystPro

[Product code]
**FAP-240**

Development tool for monitoring the FlexRay network. AnalystPro View (control software) is used to monitor FlexRay frame data flowing between nodes. By recording data to PC, tool assists user in debugging and analyzing.
- Compact (80 mm wide x 20 mm high x 54 mm deep); weighs approximately 80 g
- Supporting the USB 2.0 interface for PCs
- Using a FlexRay communications rate of 10 Mbps, 5 Mbps or 2.5 Mbps
- Supporting two FlexRay bus channels
- FlexRay Configurator Pro Lite (this version of software has limited functions) is provided. With its GUI, the user can set parameters required for controller operation.

[Components]
- FlexRay AnalystPro main body
- USB cable for PC connection
- FlexRay cable
- AC adaptor
- AnalystPro View (control software)
- Manual

**Advanced Data Controls Corp.**
E-Mail: sales@adac.co.jp
http://www.adac.co.jp

## FlexRay Signal Analyzer DL7400 Series

[Product code]
**DL7440 / DL7480**

Tool for FlexRay bus signal capture and protocol analysis. Enables user to observe signal waveforms associated with analysis results, evaluate bus signal waveform quality and note the occurrence of glitches, noise and other signals occur.
- Generates triggers in the FlexRay frame format. In case of the CRC error, it generates a trigger. It can generate a combination trigger when receiving both the FlexRay signal and another signal.
- Analyzing FlexRay bus signal protocol, and listing analysis results. (User selects frame/segment from list of analysis results. The tool links a physical layer waveform with the frame/segment, and displays a (magnified) waveform on the LCD screen.)

[Components]
- FlexRay Signal Analyzer DL7440 or DL7480 main body
- Differential probe Part No. 701920 or 701922 (sold separately)

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**Communications and Instruments Dept.**
**Yokogawa Electric Corp.**
2-9-32, Naka-cho, Musashino-shi,
Tokyo 180-8750
TEL: 0120-137-046 (toll-free)
FAX: 0422-52-6624
http://www.yokogawa.co.jp/

## FlexRay Bus Analyzer FLEXcope

[Product code]
**GT300**

High-performance bus analyzer that can operate at the same speed as FlexRay, which is a high-speed in-vehicle networking. The tool captures complex chained communications data.
- Measurement Functions
  Real-time monitoring and logging functions (with sampling filter)
- Abundant Event Inputs
  Number of settings: four. Trigger conditions: header segment, payload segment, symbol, error and other events.
- Filter Functions
  Sampling on a particular condition: frame ID, region, channel, one-point detailed filter and three-point simple filter.
- Using a FlexRay communications rate of 10 Mbps, 5 Mbps or 2.5 Mbps

[Components]
- FLEXcope main body
- USB cable for PC connection
- FlexRay cable
- CD-ROM (control software, manual)
- AC adaptor

**Business Center**
**Automotive Equipment Dept.**
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4 Automotive

## 1 Getting Started

An easy to understand “Getting Started” page is provided for customers who are visiting the Renesas website for the first time.
New users and also regular visitors highly value this page, and use it not only to learn how to use the site, but also as a shortcut to various other information sources.

### Parametric Table

You can use the Renesas Parametric Search Engine to quickly find a part that meets your specific needs.

### Renesas Interactive Online Training

Renesas Interactive Online Training provides everything you need to learn about and evaluate Renesas products.

## 2 MY RENESAS

If you register with us you can request samples of products and receive our informative Mail Magazine.
We are continuing to develop powerful tools to assist you in your designs.

## 3 More Powerful Search Function

Information can be found using four search methods: part number search, function search, document search and keyword search.
You can find the product that is perfect for your requirements quickly and easily

## 4 Finding Applications

We introduce a variety of applications which use Renesas products to our customers.
We provide system block diagrams and recommended devices to help you find quick solutions to problems.

## 5 Abundant Documents

We provide a wide range of document PDFs, and all the information necessary for MCU development environments.
Such information assists system development for our customers. Ordering ROM data or samples online is possible, and our online helpdesk provides added reassurance.

### Development Environment

To satisfy your evolving needs, we work continuously to enhance our support system by improving the functions of our existing development environments, and by introducing new development environments.

### Application Notes

Renesas provides abundant application notes in order to assist design engineers all over the world.

### Frequently Asked Questions (FAQ)

Frequently asked questions (FAQ) are important elements in the design process.
We provide a full range of answers, to help assist design engineers all over the world.

### Download

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Free evaluation versions can be downloaded from the site.

Abundant information about Renesas semiconductor products precisely meets your needs.
Additionally, a full range of information on microcomputer development environments offers you powerful assistance in system development.

Use the Renesas Website
for your business

http://www.renesas.com

RENESAS
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RENESAS

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http://www.renesas.com

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